ORDER NO. KM48811777C
F1

Service Manual

and Technical Guide

EASA-PHONE®

ITS 2-LINE Integrated Telephone System

Telephone Equipment

KX-T3250

■ SPECIFICATIONS

Power Source:	Telephone line voltage, AC adaptor KX-A09
Memory Capacity:	28 telephone numbers, up to 16 digits for each station
Dial Speed:	Tone (DTMF)/Pulse (10 PPS)
Redial:	Last dialed telephone number up to 15 times within a 10-minute period
Automatic Shut-off:	When line is busy (in on-hook redial mode)
Pause:	Two automatic dial tone detectors
Speaker:	Unit; $2^{1}/_{2}$" (6.5 cm) PM dynamic speaker Handset; $1^{3}/_{16}$" (3 cm) PM magnetic type receiver
Microphone:	Electret condenser microphone
Input Jacks:	Telephone line, DC IN, EXT Music Jack
Dimensions:	$6^{7}/_{8}$" × $8^{29}/_{32}$" × $3^{21}/_{32}$"
(W × D × H)	(175 × 226 × 93 mm)
Weight:	2 lb. 0.81 oz. (930 g)

Design and specifications are subject to change without notice.

Panasonic

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LOCATION OF CONTROLS

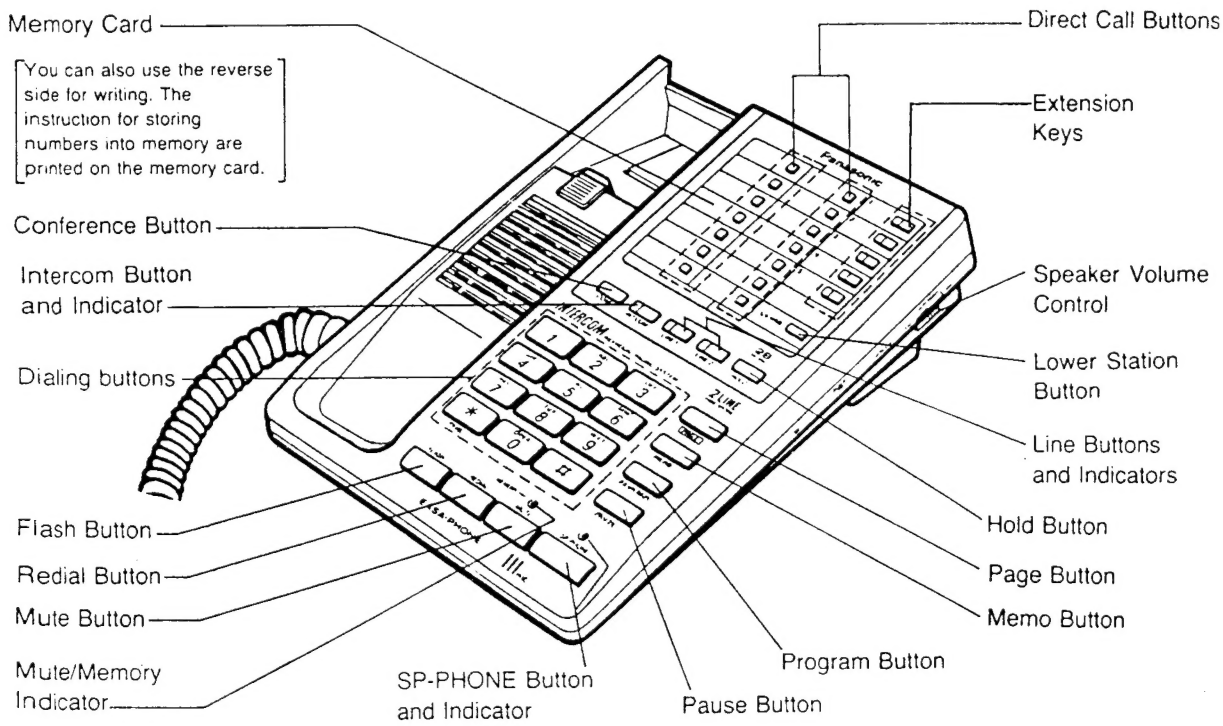


Fig. 1

DISASSEMBLY INSTRUCTIONS

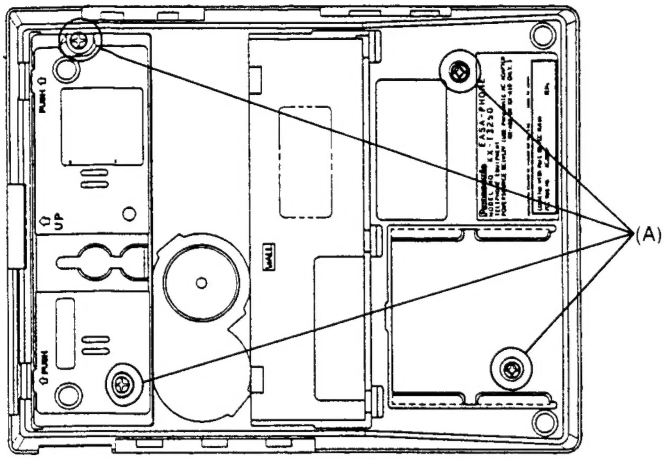


Fig. 2

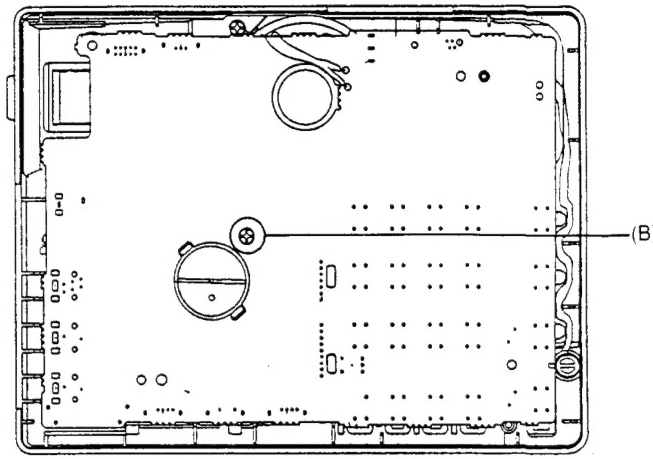


Fig. 3

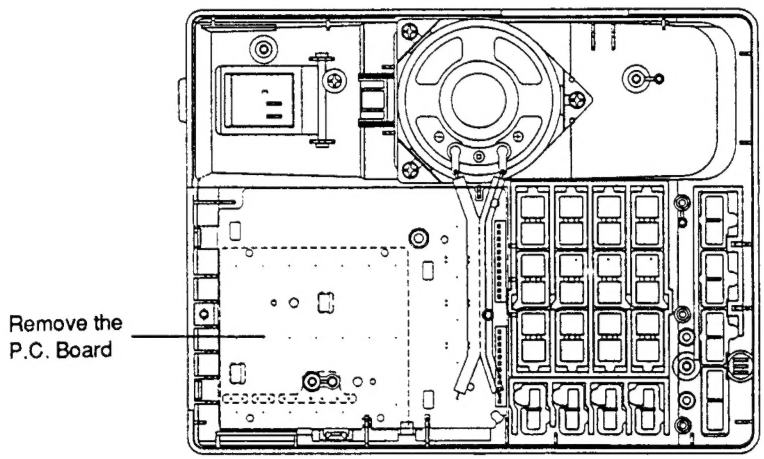


Fig. 4

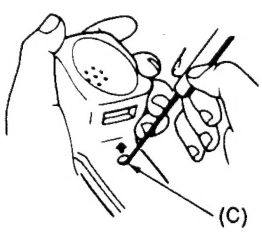


Fig. 5

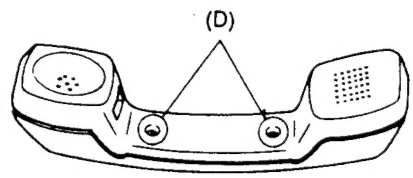


Fig. 6

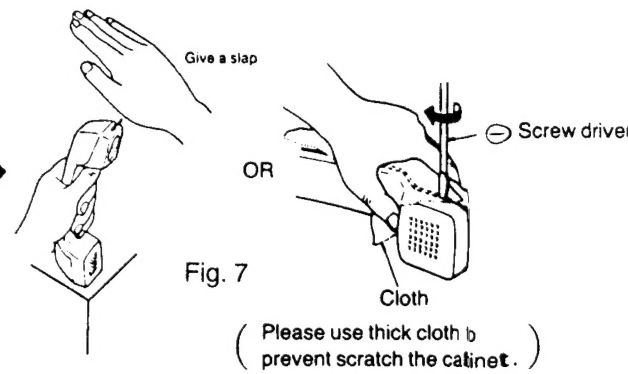
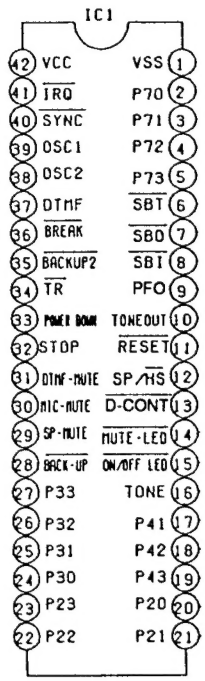


Fig. 7

Ref. No.	Procedure	Shown in Fig.—.	To remove—.	Remove—.
1	1	2	Lower Cabinet	Screws (3 × 14) . . . . . (A) × 4
2	1, 2	3	Printed Circuit Board	Screw (3 × 8) . . . . . (B) × 1
3	1~3	4	Memory Station Board	Remove the P.C. Board
4	5~7	5	Handset Cabinet	Rubbers . . . . . (C) × 2
5		6		Screws (3 × 10) . . . . . (D) × 2
6		7		Remove the cabinet

CPU DATA



IC1: MN158413KTZ
Program ROM: 4K byte
Internal RAM: 3K bits
Clock Frequency: 3.58 MHz
Power Supply Voltage: 5 V

Pin No.	Mark	Function	High	Low
1	Vss	GND Terminal		
2	P70	Key Scan Output	High-imp	Active
3	P71	Key Scan Output		
4	P72	Key Scan Output		
5	P73	Key Scan Output		
6	$\overline{SBT}$	Serial Clock	Normal	Active
7	$\overline{SBO}$	Serial Output		
8	$\overline{SBI}$	Serial Input		
9	PFO	Serial Busy Output		
10	TONE OUT	Audible Tone Output		Normal
11	$\overline{Reset}$	Reset Input	Normal	Active
12	SP/$\overline{HS}$	SP/HS control output	Speakerphone	Handset
13	$\overline{D\text{-}CONT}$	Dial-tone control signal output	Normal	Active
14	$\overline{Mute\text{-}LED}$	Mute -LED, Control Output	OFF	ON
15	$\overline{ON/OFF\text{-}LED}$	ON/OFF-LED, Control Output	OFF	ON
16	Tone	Tone signal Input	Sound	No sound
17	P41	Option Data Input	Normal	Active
18	P42	Key Input	Disable	Enable
19	P43	Key Input	Disable	Enable
20	P20	Key Scan Output	Normal	Active
21	P21	Key Scan Output		
22	P22	Key Scan Output		
23	P23	Key Scan Output		
24	P30	Key Input	Disable	Enable
25	P31	Key Input		
26	P32	Key Input		
27	P33	Key Input		
28	$\overline{Back\ up}$	Not Used		
29	SPMute	SP Mute Control Output	ON	OFF
30	Mic Mute	Mic Mute Control Output	ON	OFF
31	DTMF Mute	Not Used		
32	Stop	Stop Signal Input	Stand by	Normal
33	Power Down	Power Down Input	Normal	Active
34	$\overline{TR}$	Hold Output	Circuit OFF	Circuit ON
35	$\overline{Back\ up\ 2}$	A power failure, Relay Output		Active
36	$\overline{Break}$	Pulse Dial Output	Make	Break
37	DTMF	DTMF Signal Output		Normal
38	OSC2	Scan Clock		
39	OSC1	Scan Clock		
40	$\overline{SYNC}$	Not Used		
41	$\overline{IRQ}$	Not Used		
42	VCC	+ Power Source Terminal		

IC2:	PQVI4240A12S
Program ROM:	4K byte
Internal RAM:	256 × 4 bits
Clock Frequency:	4.19 MHz
Power Supply Voltage:	5 V

Pin No.	Mark	Function	High	Low
1	EXT 3	LED, Extension 3	Active	
2	EXT 4	LED, Extension 4		
3	EXT 5	LED, Extension 5		
4	----	----------		
5	L1- RLY	Relay, Line1	Active	
6	L1- HRLY	Relay, Line1 (Hold)		
7	L2- RLY	Relay, Line2		
8	L2- HRLY	Relay, Line2 (Hold)		
9	$\overline{\text{BELL - L1}}$	Bell Detector Input (Line 1)		Active
10	$\overline{\text{BELL - L2}}$	Bell Detector Input (Line 2)		
11	ICM - HIGH	Ringer Volume Off Data Input (INTERCOM)		
12	ICM - OFF	Ringer Volume Off Data Input (INTERCOM)		
13	RING - OUT 1	Ringer Tone Data Output	Active	
14	RING - OUT 2	Ringer Tone Data Output		
15	RING - OUT 3	Ringer Tone Data Output		
16	RING - $\overline{\text{H/L}}$	Ringer Volume Data Output	Low	High
17	L2 - HIGH	Ringer Volume High Data Input (Line2)	Active	
18	L2 - OFF	Ringer Volume OFF Data Input (Line2)		
19	L1 - HIGH	Ringer Volume High Data Input (Line1)		
20	L1 - OFF	Ringer Volume OFF Data Input (Line1)		
21	VCC	+ Power Supply		
22	SCK	Serial Clock	Active	
23	SI	Serial Input		
24	SO	Serial Output		
25	SB	Serial Busy Line		
26	RESET	Reset Input	Reset	Active
27	TEST	Micro Computer Test		
28	OSC1	Oscillator Input		
29	OSC2	Oscillator Input		
30	GND	GND Terminal		
31	M - HOLD	SP Music Hold Control	Active	
32	ICM - OUT	Communication Date Output	Normal	Active
33	ICM - IN	Communication Date Input	Normal	Active
34	ICM - RLY	Relay, Intercom	Active	
35	L2 - RED	LED, Line2 (RED)		
36	L2 - GRN	LED, Line2 (GREEN)		
37	L1 - RED	LED, Line1 (RED)		
38	L1 - GRN	LED, Line1 (GREEN)		
39	ICM - RED	LED, Intercom (RED)		
40	ICM - GRN	LED, Intercom (GREEN)		
41	EXT1	LED, Extension 1		
42	EXT2	LED, Extension 2		

Circuit Operarion:

(IC1)

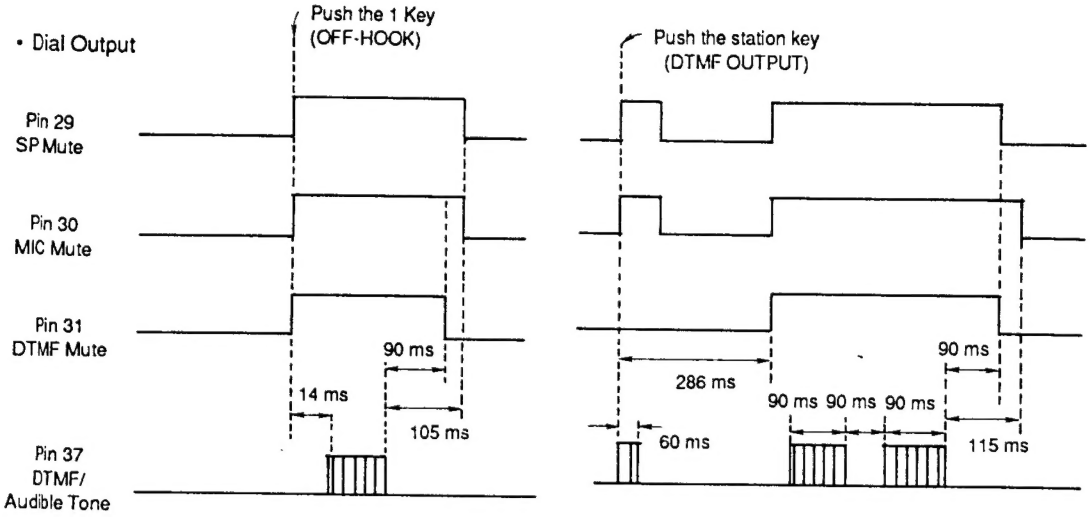
- Pin 1 is ground.
- Pin 2~5 output the scaning signal to the Dial, Pause, Redial, Flash, and the Mute SW.
- Pin 6 outputs the standard clock.
- Pin 7 outputs the data.
- Pin 8 inputs the data.
- Pin 9 outputs the Serial-Busy signal. When outputting the Serial-Busy signal, its output is a low level.
- Pin10 is the terminal for the Audible Tone signal output.
- Pin11 inputs the reset signal to CPU. When reset, its input is Low level.
- Pin 12 outputs the speakerphone/Handset selector signal. (H:Speakerphone , L: Handset)
- Pin 13 outputs the Dial-tone control signal.
- Pin 14 and 15 output the Mute and the Speakerphone ON/OFF LED indicators.
- Pin 17 is the detector input for each tone from the Tel Line . When a tone signal is detected, its level is High.
- Pin 18 and 19 are the key data input ports.
- Pin 20~23 output the scanning signal to station key, MEMO and the Lower SW.
- Pin 24~27 are the Key data input ports.
- Pin 29, 30 are the muting control signal. During muting, its output is a High level.
- Pin 32 inputs the stop detector signal. (to make the memory backup condition to the CPU.)
- Pin 33 inputs a Low level when power-down.
- Pin 34 outputs the tip ring control signal. When the Hold Switch is pressed or speakerphone mode (Handset is ON-HOOK), it outputs a LOW level.
- Pin 35 : When a power failure, occurs it outputs a Low level.
- Pin 36 is an output to control the Make/Break of the pulse dialing. During the Break, its output is a Low level.
- Pin 37 is the terminal for the DTMF signal output.
- Pin 41 inputs the ON/OFF and the Program SW. When inputting, its input is a Low level.
- Pin 42 is the ⊕ power supply input of the CPU.

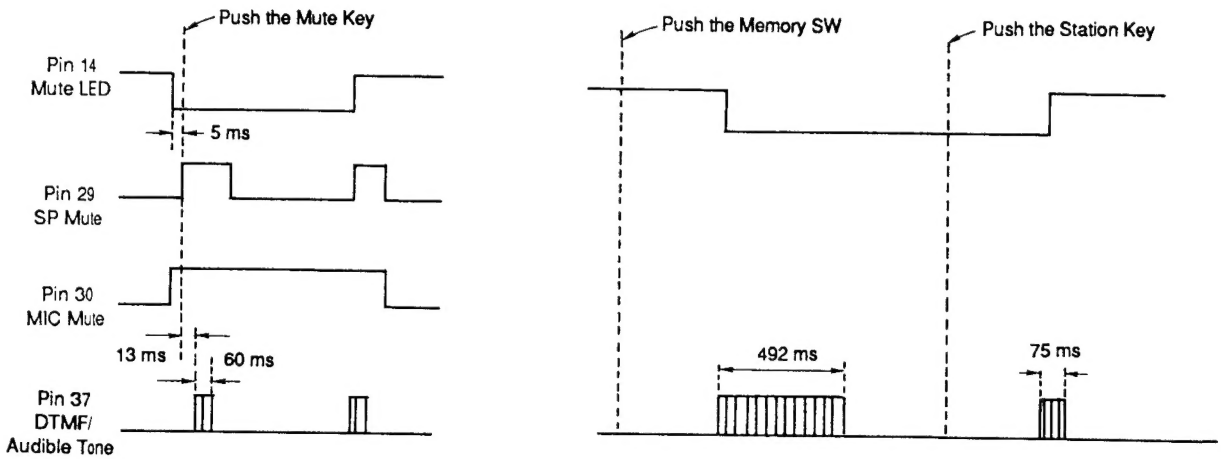
(IC2)

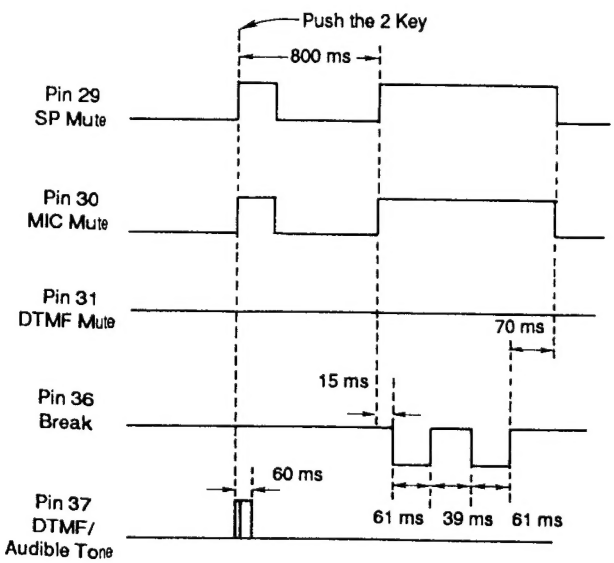
- Pin 1 outputs LED control signal of Extension 3. Then the LED lights, its output is High level.
- Pin 2 outputs LED control signal of Extension 4. Then the LED lights, its output is High level.
- Pin 3 outputs LED control signal of Extension 5.Then the LED lights, its output is High level.
- Pin 5 outputs Line Relay control signal of Line1. When the Relay is ON, its output is High level.
- Pin 6 outputs Hold Relay control signal of Line 1. When the Relay is ON, its output is High level.
- Pin 7 outputs Line Relay control signal of Line 2. When the Relay is ON, its output is High level.
- Pin 8 outputs Hold Relay control signal of Line2. When the Relay is ON, its output is High level.
- Pin 9,10 input bell detector of Line 1 (Line 2).
- Pin 11,12 input Ringer Volume SW signal (Intercom).
- Pin 13~15 output Ringer Tone Data of Line 1 (Line 2).
- Pin 16 outputs Riger Volume Data signal.
- Pin 17 inputs Ringer Volume SW signal of Line 2. When the SW is set High, its input is High level.
- Pin 18 inputs Ringer Volume SW signal of Line 2. When the SW is set Low, its input is High level.
- Pin 19 inputs Ringer Volume SW signal of Line 1. When the SW is set High, its input is High level.
- Pin 20 inputs Ringer Volume SW signal of Line 1. When the SW is set Low, its input is High level.
- Pin 21 is the ⊕ power supply input of CPU.
- Pin 22 outputs Serial-Clock from IC1.
- Pin 23 outputs Serial Data from IC1.
- Pin 24 inputs Serial Data from IC1.
- Pin 25 inputs Serial-busy from IC1.
- Pin 26 inputs the reset signal to CPU. When reset, its, input is High level.
- Pin 30 is a GND Terminal.
- Pin 31 outputs SP Music Hold control signal. When SP Music Hold is ON, its output is High level.
- Pin 32 outputs communication Data signal.
- Pin 33 inputs communication Data signal.
- Pin 34 outputs Intercom Relay control signal. When the Relay is ON, its output is High level.
- Pin 35 outputs red LED control signal of Line 2. Then the LED lights, its output is High level.
- Pin 36 outputs green LED control signal of Line 2. Then the LED lights, its output is High level.
- Pin 37 outputs red LED control signal of Line 1. Then the LED lights, its output is High level.
- Pin 38 outputs green LED control signal of Line 1. Then the LED lights, its output is High level.
- Pin 39 outputs red LED control signal of Intercom .Then the LED lights, its output is High level.
- Pin 40 outputs green LEDcontrol signal of Intercom .Then the LED lights, its output is High level.
- Pin 41 outputs LED control signal of Extension 1. Then the LED lights, its output is High level.
- Pin 42 outputs LED control signal of Extension 2. Then the LED lights, its output is High level.

Timing Chart (IC1)

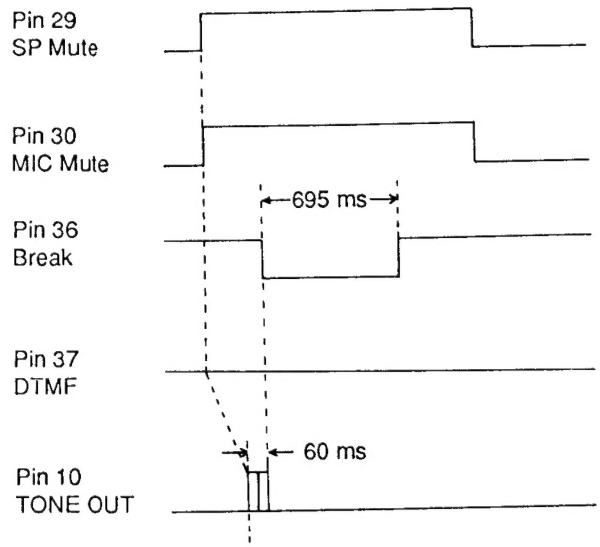
• Dial Output

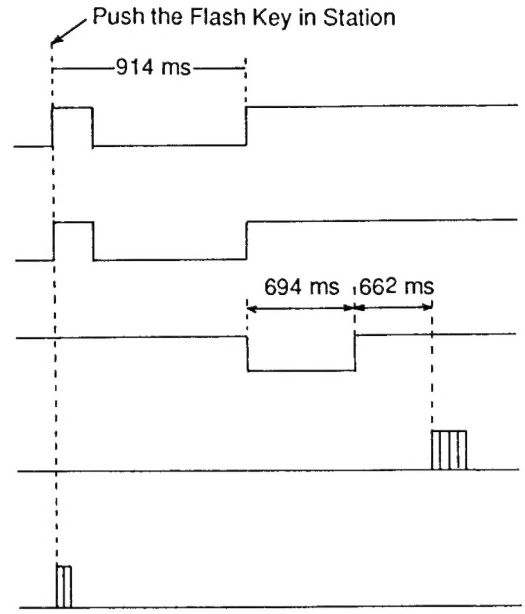


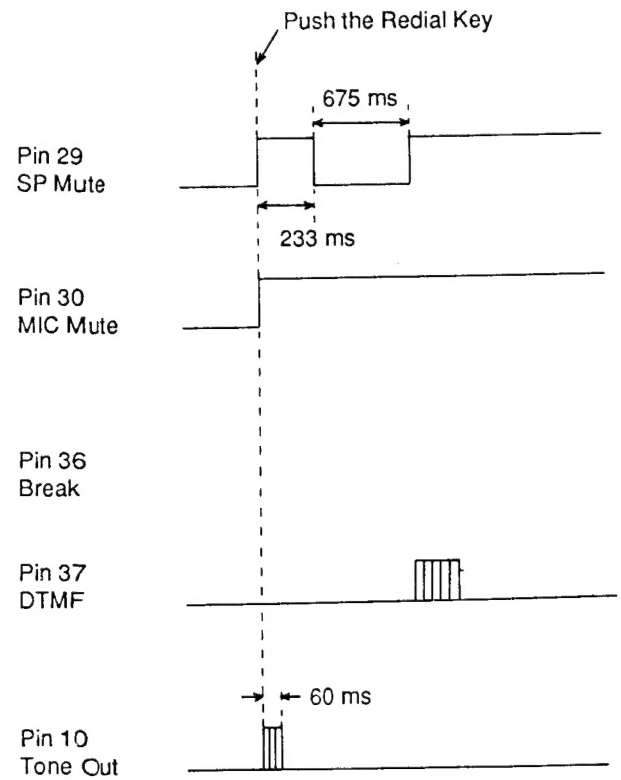


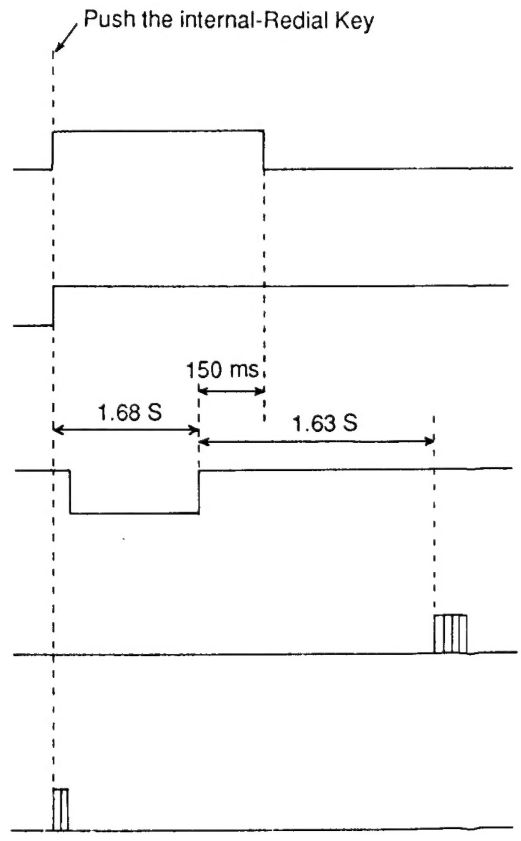


Flash/Redial









HANDSET PARTS LOCATION

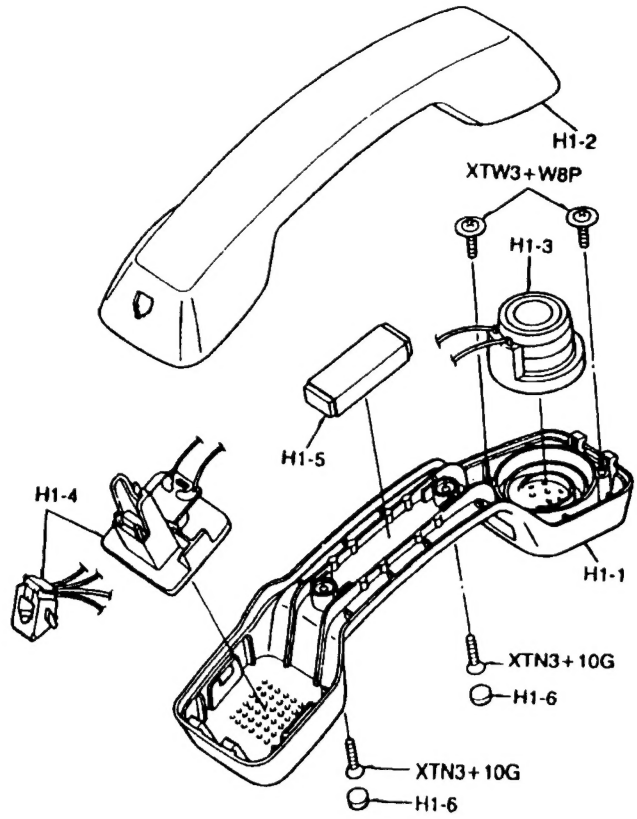
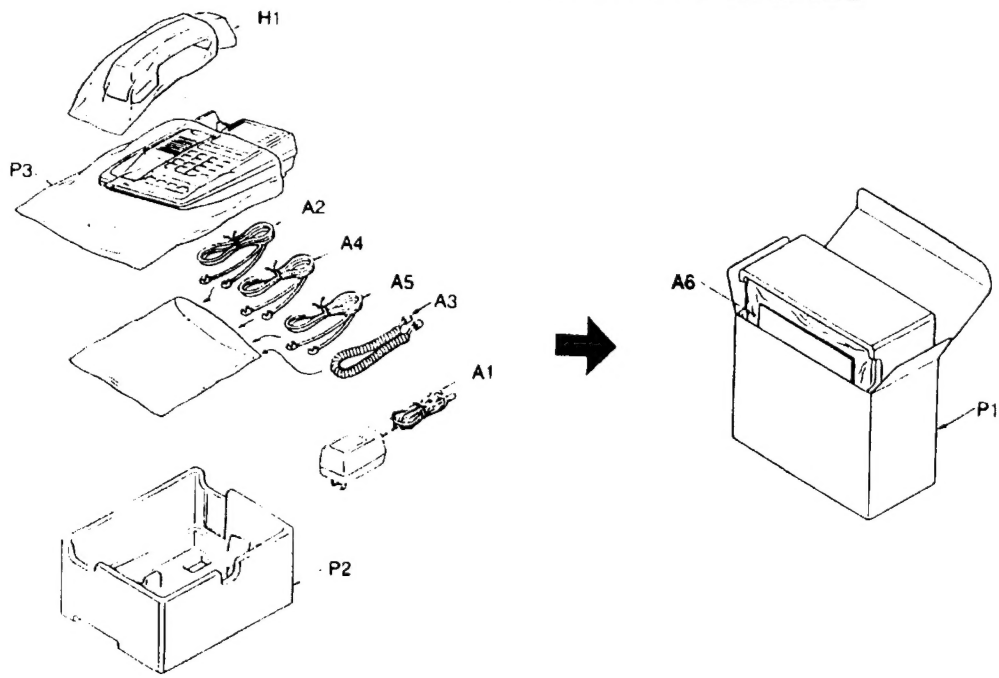


Fig. 8

ACCESSORIES & PACKING MATERIALS



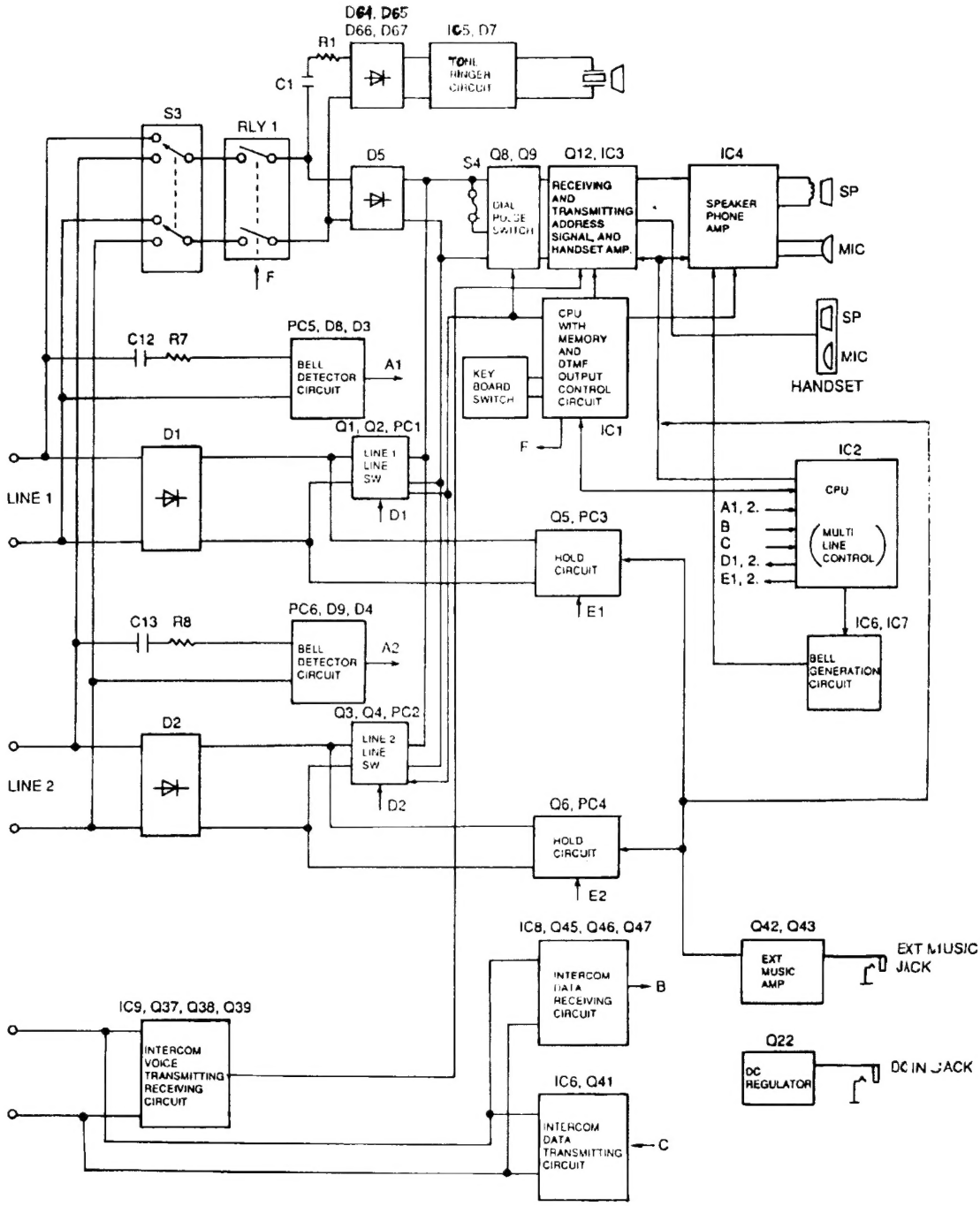
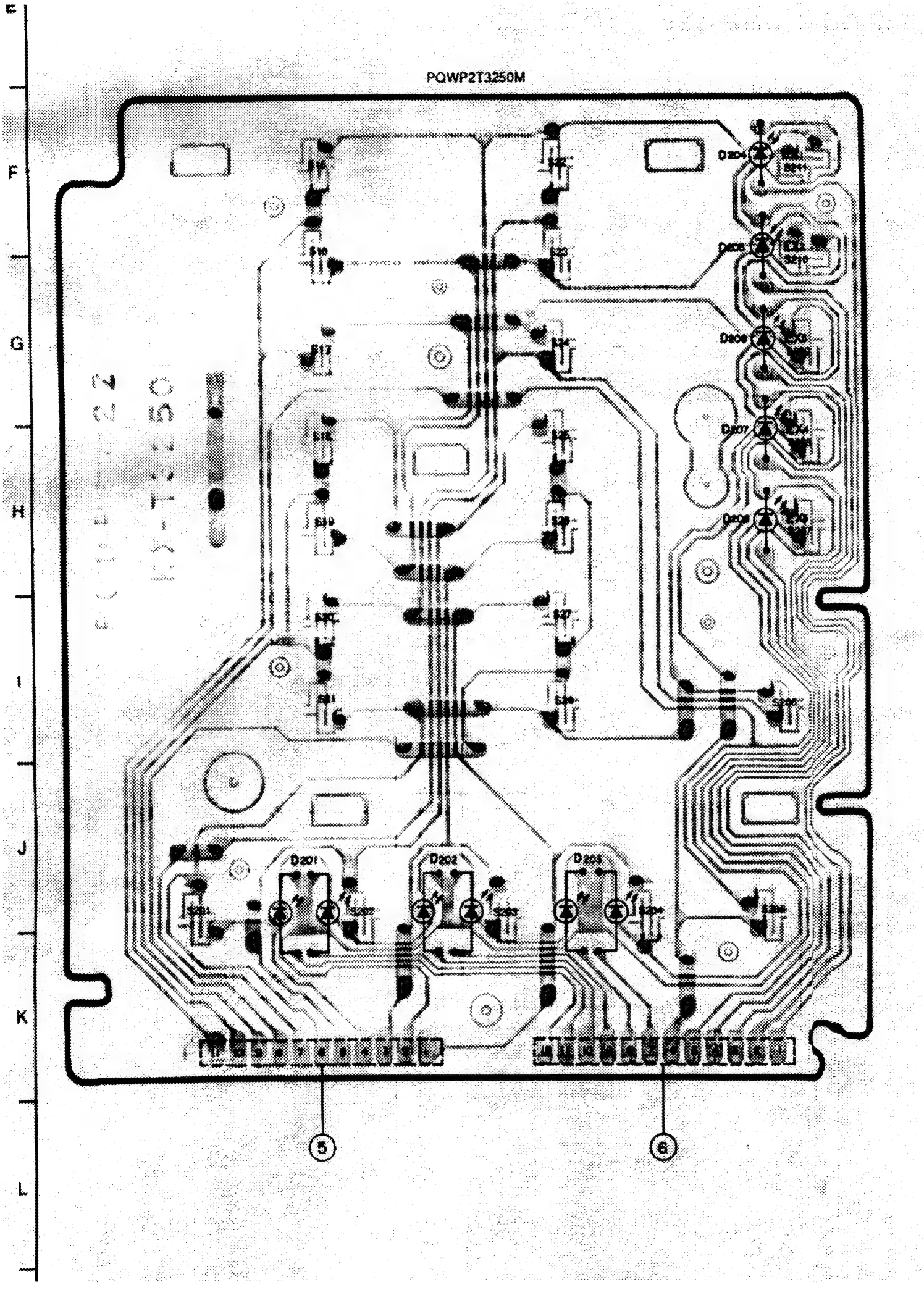
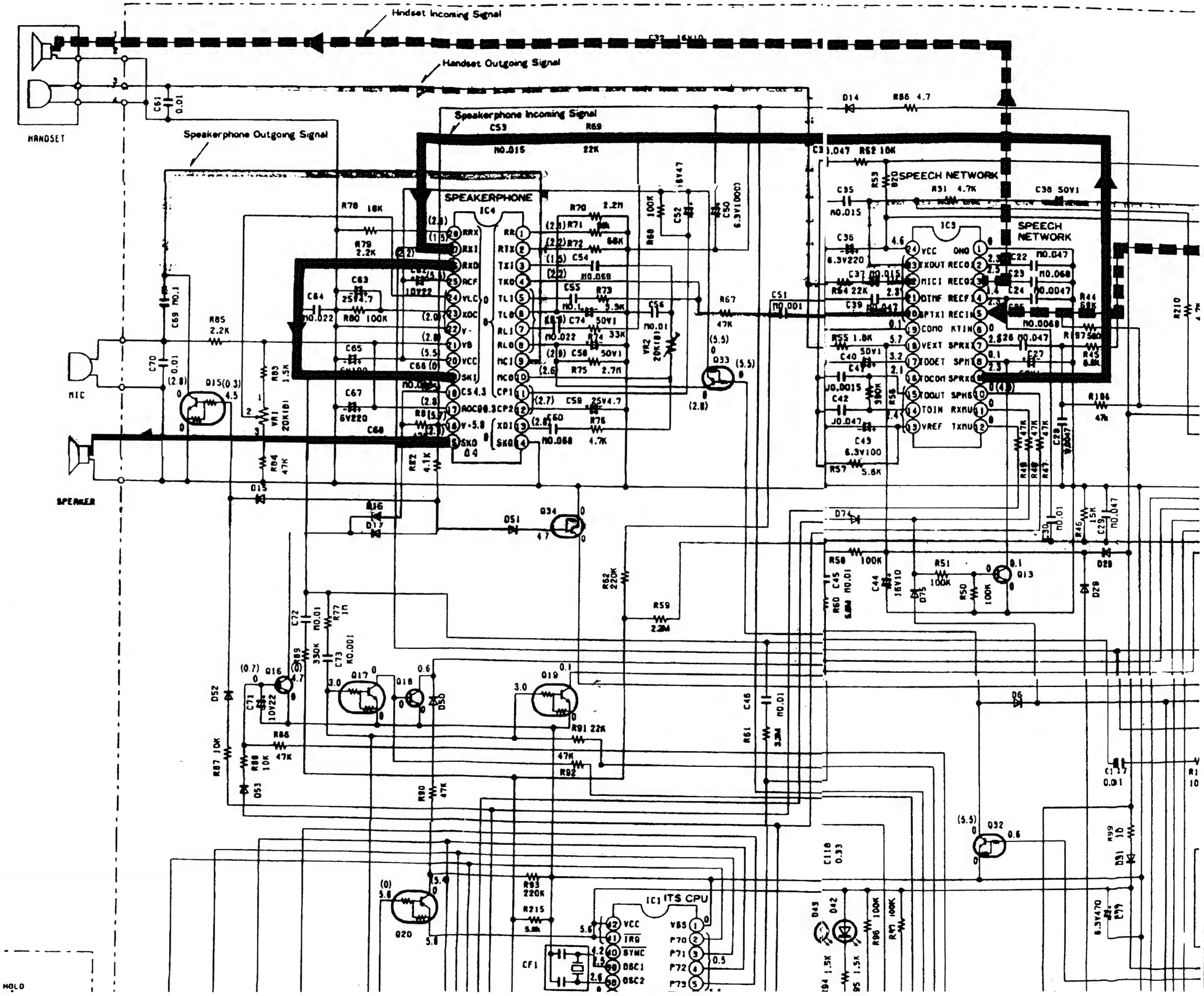

D64, D65
D66, D67
IC5, D7
R1
C1
TONE RINGER CIRCUIT
S3
RLY 1
D5
S4
Q8, Q9
Q12, IC3
IC4
DIAL PULSE SWITCH
RECEIVING AND TRANSMITTING ADDRESS SIGNAL AND HANDSET AMP.
SPEAKER PHONE AMP
SP
MIC
F
CPU WITH MEMORY AND DTMF OUTPUT CONTROL CIRCUIT
SP
MIC
HANDSET
C12 R7
PC5, D8, D3
BELL DETECTOR CIRCUIT
A1
KEY BOARD SWITCH
IC1
F
D1
Q1, Q2, PC1
LINE 1 LINE SW
D1
IC2
CPU
LINE 1
A1, 2.
B
C
D1, 2.
E1, 2.
MULTI LINE CONTROL
Q5, PC3
HOLD CIRCUIT
E1
C13 R8
PC6, D9, D4
BELL DETECTOR CIRCUIT
A2
IC6, IC7
BELL GENERATION CIRCUIT
D2
Q3, Q4, PC2
LINE 2 LINE SW
LINE 2
D2
Q6, PC4
HOLD CIRCUIT
E2
IC8, Q45, Q46, Q47
INTERCOM DATA RECEIVING CIRCUIT
B
Q42, Q43
EXT MUSIC AMP
EXT MUSIC JACK
IC9, Q37, Q38, Q39
INTERCOM VOICE TRANSMITTING RECEIVING CIRCUIT
Q22
DC REGULATOR
DC IN JACK
IC6, Q41
INTERCOM DATA TRANSMITTING CIRCUIT
C

Fig. 10

PQWP2T3250M




Handset Incoming Signal
Handset Outgoing Signal
Speakerphone Incoming Signal
Speakerphone Outgoing Signal
HANDSET
MIC
SPEAKER
SPEAKERPHONE
IC4
SPEECH NETWORK
IC3
IC1 ITS CPU
CF1
S204 LINE2
S203 LINE1
S202 INT.COM
S201 CONF.
HOLD

CF4

ICS TONE RINGER

REGULATOR

R1 6.8K

C1 K1.0 (250V)

RECTIFIER

C7 K680P

D05

RLY1

S3

LINE1
LINE2
LINE1
LINE2

POWER FAILURE LINE SELECT SW

C8 K680P

D80

R8 4.7K

2.7

0.1

Q7

JJ1

LINE1 / LINE2 / E

Q1 RECTIFIER

SA1

C6 K680P

C9 K680P

D2

SA2

C10 K680P

C11 K680P

JJ2

LINE1 / LINE2

R7 47K

C12 K0.22 (250V)

PC5

D8

D3

R8 47K

C13 K0.22 (250V)

PC6

D9

D4

JJ9

LINE

C15 M0.033

R37 620

C17 10V47

CURRENT LIMITER

R32 10

Q12 AMP 9.2

C82 K680P

R40 10K

R39 5.6K

R33 100

R34 4.7K

Q11

R30 100 (1W)

D12

D10 9.2

R35 4.7K

R36 10K

C83 16V10

C18 6.3V470

D13

R42 1.5K

C15 3033.3

R41 15

R38 33

R210 4.7K

22 (1W)

R25 100K

R26 4.7K

R27 68K

Q9

C14 0.01

R28 100K

HOOK

D11

R14 4.7K

PC2

R13 100K

R10 4.7K

PC1

R11 100K

Q4

D67

D2

Q2

Q6 0.4

R21 100K

R22 4.7K

R24 1K

R23 390 (2W)

D72

PC4

Q5 11.1

R17 100K

R18 4.7K

R20 1K

R19 390 (2W)

D73

PC3

C29 M0.047

D28

D29

REGULATOR

C21 M0.01

R144 470K

D30

C31 M0.01

R164 100K

R192 330K

R191 100K

R190 10K

C40 0.01uF

INVERTER

IC9

C126 M0.0033

C125 M0.033

R64 1.2M

C42 J0.01

D26

D71

D31

C77 6.3V470

C117 0.01

R99 10

R193 100K

ANALOG SWITCH

R183 100K

IC7

C87 M0.01

R185 100K

R184 27K

R187 68K

R209 470K

R186 10K

C118 J0.0012

C115 J15P

CF3

R200 8.2K

R202 2.2K

C114 220K

R208 100K

Q440

INVERTER

IC6

R109 22K

R110 22K

R254 22K

R253 22K

D22

D25

R145 10M

R141 220K

T4

C19 50V1

R166 2.7K

C20 50V1

R198 2.7K

R163 3.3K

C101 M0.1

R123 1M

R122 1M

C105 330P

R120 1M

C109 0.1

R105 18K

Q43

Q48

Q42

R121 100

R124 6.8K

EXT MUSIC JACK

T1

C120 50V10

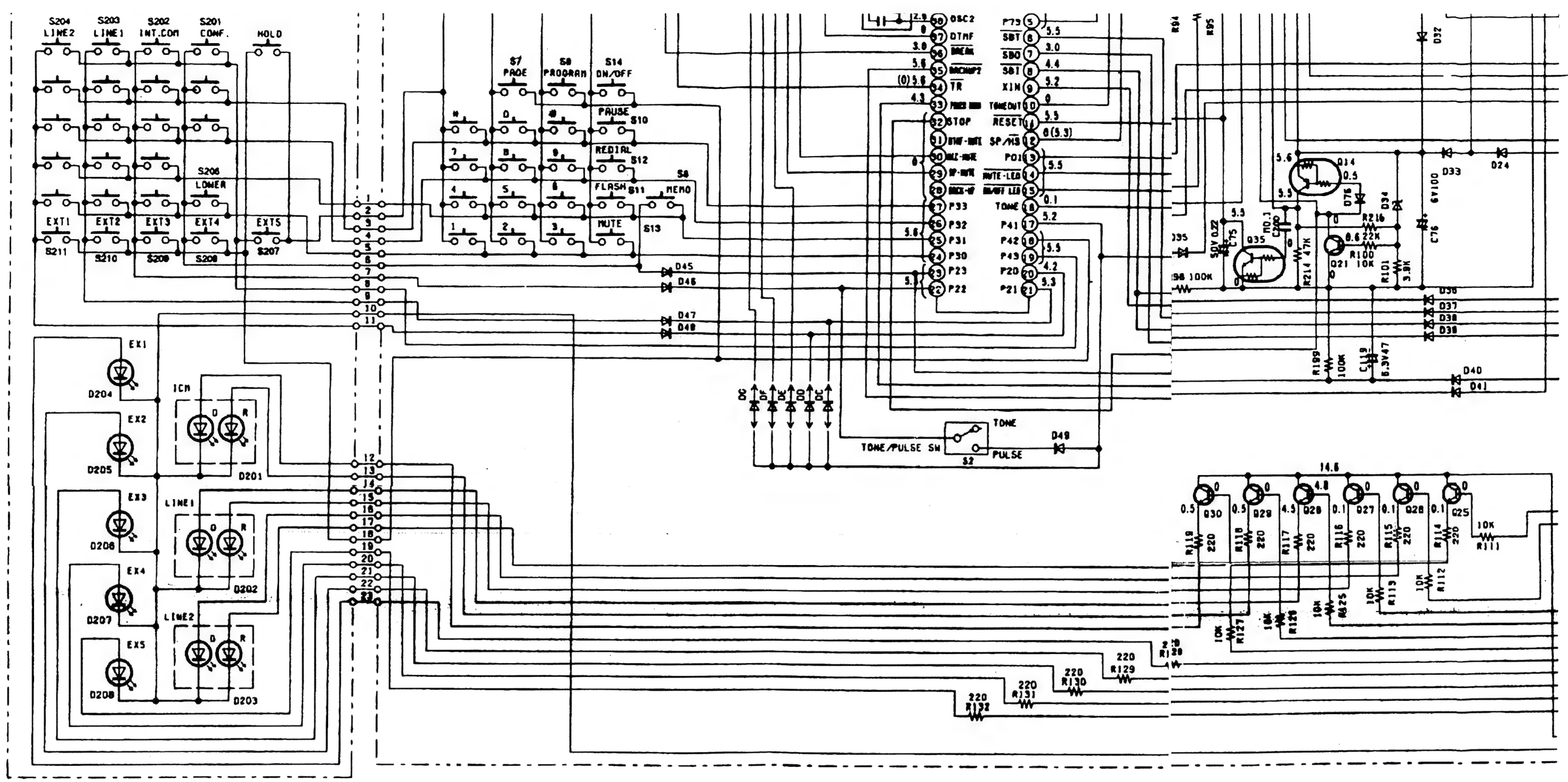
R134 10K

D36 5.1

R133 3.3K

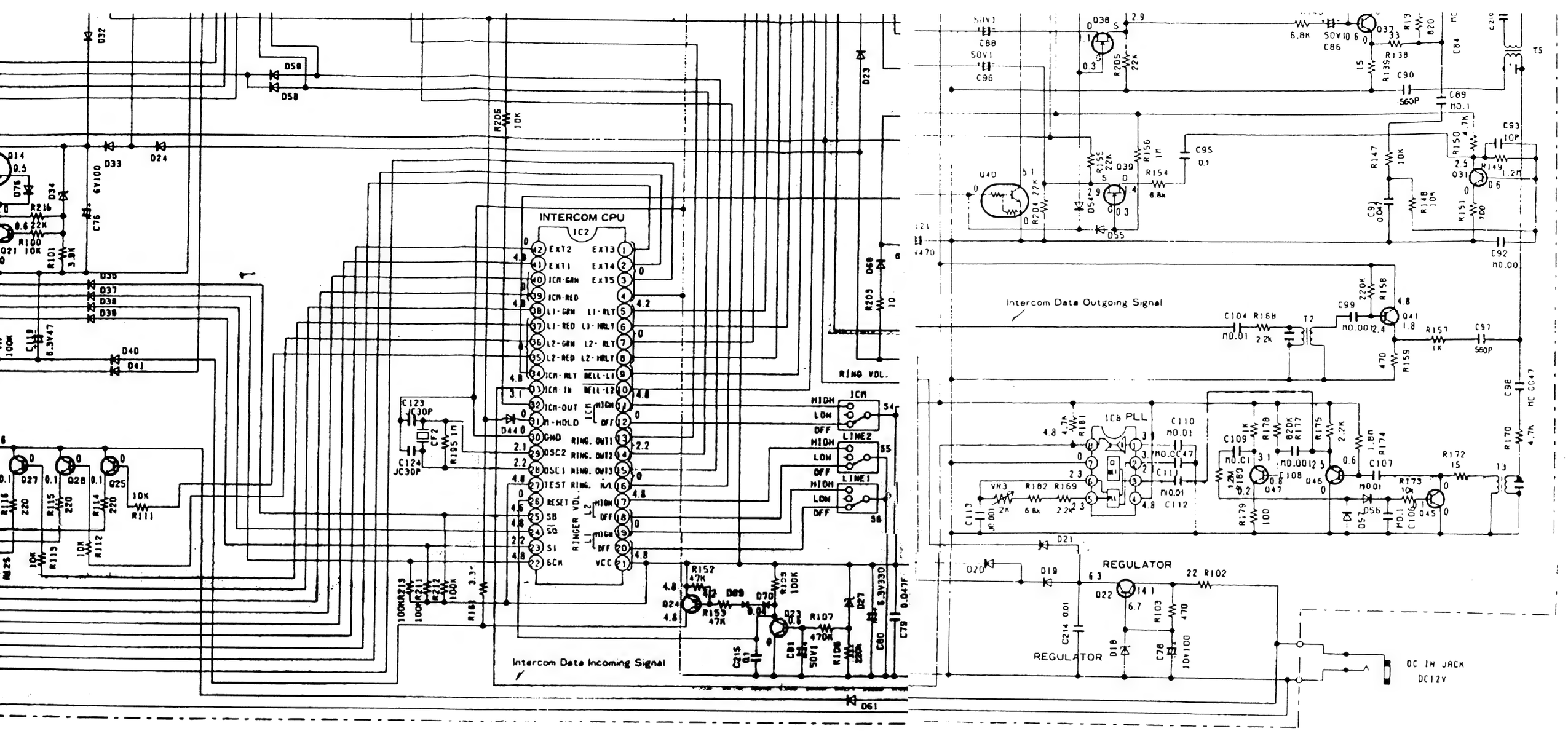
R135 10K

R136 50K



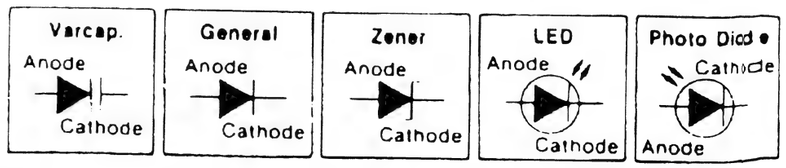
Notes:

1.	S1:	Hook switch in "ON-HOOK" position.
2.	S2:	Tone/pulse Selector switch in "PULSE" position.
3.	S3:	Power Failure Line Selector Switch in "L1" position.
4.	S4, 5, 6:	Ringer Volume Selector in "HIGH" position.
5.	S7:	Page switch
6.	S8:	Memo switch
7.	S9:	Program switch
8.	S10:	Pause switch
9.	S11:	Flash switch
10.	S12:	Redial switch
11.	S13:	Mute switch
12.	S14:	Speakerphone switch.
13.	S15~28:	Direct Call Switch
14.	S201:	Conference switch
15.	S202:	Intercom switch
16.	S203:	Line 1 Selector switch
17.	S204:	Line 2 Selector switch
18.	S205:	Hold switch
19.	S206:	Lower Station switch
20.	S207–211:	Extension switch
21.	DC voltage measurement is taken with electronic voltmeter from negative line. (Add 40 mA to telephone line from the loop simulator.) ( ): Speakerphone ON	



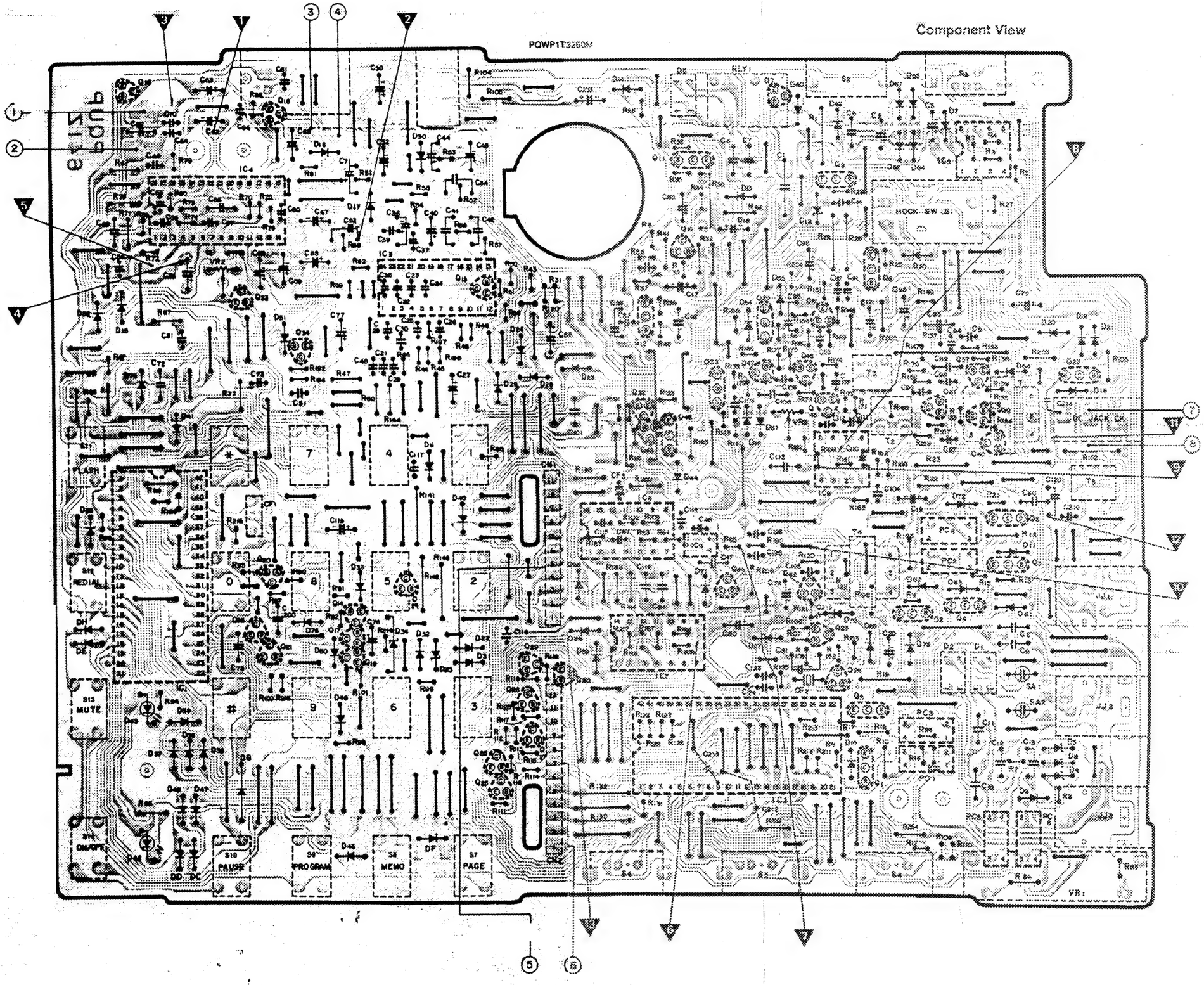
22. This is schematic diagram may be modified at any time with the development of technology.
23. Important safety notice

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded areas of the schematic.



ter from negative line.
): Speakerphone ON

Component View

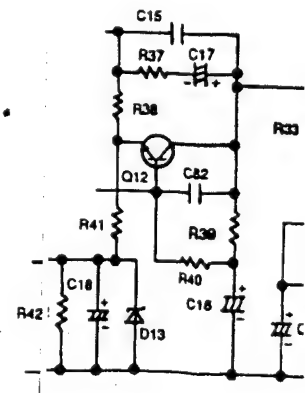


HOW TO CHECK INTERCOM CALL

ITEM	REMARKS
(1) Adjustment of Intercom	1. Connect the resistor (150Ω) Test Points ▽–▽. 2. Connect Testpoints ▽–▽ (Then a continuos Signal of 100 kHz be outputted). 3. Connect the VTVM to Test Points ▽–▽. 4. Adjust T2 and T5 so that voltage is maximum by VTVM. 5. Connect the VTVM to Test Points ▽–▽. 6. Adjust T3 so that voltage is maximum by VTVM (more than −10 dBm). 7. Next, connect the VTVM to Test points ▽–▽, and confirm for a reading more than −30 dBm on VTVM. 8. Disconnect Test Point ▽–▽, and connect Test Points ▽–▽. 9. Connect the Frequency Counter to Test Points ▽–▽ (Connect the resistor 100 kΩ between Test Point ▽ to the Frequency Counter). 10. Adjust VR3 for a reading 100 kHz±0.5 kHz on the Frequency Counter. 11. After adjustment are make, disconnect the Test Points ▽–▽
(2) Confirmation of the Data Communication	1. Program the extension number to the unit. Example [Program] → [1] → [Memory] → [Program] 2. When selecting the Line key (Line 1, Line 2, Intercom), confirm that the outputting of Data Signal Ⓐ at pin 32 of IC2. 3. When selecting the Line key (Line 1, Line 2, Intercom), confirm that the outputting of Data Signal Ⓑ at Test Points ▽ –▽. 4. When selecting the Line key (Line 1, Line 2, Intercom), confirm that the outputting of Data Signal Ⓐ at pin 8 of IC8. 5. After confirmation are made, disconnect the resistor (150Ω) from Test Points ▽–▽.
(3) Confirmation of the Intercom Call and paging	1. Connect Test Points ▽–▽. 2. Program the extension number to the unit. Example [Program] → [1] → [Memory] → [Program] 3. Select the Line key to Intercom. 4. Confirm that the transmission from handset MIC is outputted to Intercom line. 5. When inputting the signal to Intercom line, confirm that the signal can hear with handset receiver. 6. When pressing the speakerphone button, confirm that transmission from speakerphone MIC is outputted to Intercom line. 7. Press the speakerphone button. When inputting the signal to Intercom line, confirm that the sound can hear from speaker. 8. Disconnect Test Points ▽–▽.

Perform the following adjustment aft
T3 and T5.

Test Equipment:
Loop Simulator RC Oscillator VTVM
Preparation:
1. Set the unit's controls as follo A. SP-PHONE SWITCH—"O B. VOLUME CONTROL—"M
Transmission Level:
1. Connect Test Points ▽–▽. 2. Set the variable resistor of t resistance (fully counterclock 3. Connect the unit to the loop 4. Make all adjustments in a qu 5. Set the loop simulator selec 6. Connect the RC Oscillator to an electrolytic capacitor (50 V 7. Set RC Oscillator to 1 kHz, − 1 kHz, −56 dBm 50 V 8. Connect the VTVM to Test P 9. Adjust VR2 for a reading of − 10. After adjustment are made, d
Intercom Adjustments (VR3, T2,



ADJUSTMENTS

Perform the following adjustment after replacing IC4, VR2, VR3, T2, T3 and T5.

Test Equipment:

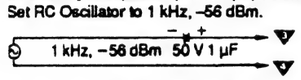
Loop Simulator
RC Oscillator
VTVM

Preparation:

1. Set the unit's controls as follows:
   A. SP-PHONE SWITCH—"ON"
   B. VOLUME CONTROL—"MAX"

Transmission Level:

1. Connect Test Points ▼–▼.
2. Set the variable resistor of the loop simulator to maximum resistance (fully counterclockwise).
3. Connect the unit to the loop simulator.
4. Make all adjustments in a quiet room.
5. Set the loop simulator selector switch to "TX".
6. Connect the RC Oscillator to Test Point ▼ –▼, and connect an electrolytic capacitor (50 V, 1 µF) as shown below.
7. Set RC Oscillator to 1 kHz, –56 dBm.



8. Connect the VTVM to Test Point ▼ (–) – ▼ (+).
9. Adjust VR2 for a reading of –23 dBm, ±0.5 dB, on the VTVM.
10. After adjustment are made, disconnect the Test Point ▼ – ▼.

Intercom Adjustments (VR3, T2, T3, T5)... Refer to left table

Please refer to Circuit Board and wiring Connection Diagram which is located test points (▼).

Schematic Diagram of Loop Simulator

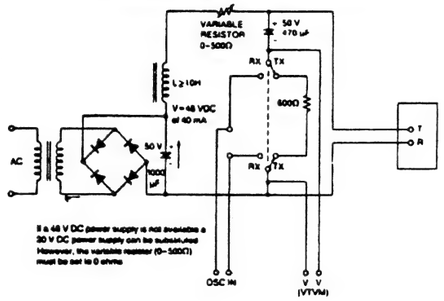


Fig. 12

CIRCUIT OPERATION

■ TELEPHONE LINE INTERFACE

Circuit Operation:

This unit is connected to the telephone circuit by a 6-core full modular jack. When L1 (L2) key is pressed, the speakerphone goes ON automatically, obtaining Line 1 (Line 2). An available line is also selected and obtained by simply putting the handset into an OFF-HOOK status. Surge absorbers SA1, SA2 are for surge suppression. The impedance of the unit is matched to each Line by the circuit in the vicinity of Q12.

When Hook Switch S1-2 is turned ON (OFF-HOOK), pin 17 and pin 23 of IC1 charge through D35, and data from pins 6, 7, 8 and 9 of IC1 is sent to pins 22, 23, 24 and 25 of IC2. As a result, an available line is selected, and the Line Switch for that line (Line1, Line2) closes.

S1-1 causes current to flow through R27 to the base of Q9 turning Q9 ON. Also, current flows through R26 to the base of Q8, turning Q8 ON. As a result, a loop is formed through D1(D2) →Q1 (Q3) →D10(D11)→ emitter of Q8 → collector of Q8→ R29 → R32 → collector of Q12 →emitter of Q12→ R41 → D13 → Q2 (Q4) → D1 (D2).

During a conference, the line current is the sum of the currents in the two lines.

If the line current exceeds 80mA , the voltage across R32 increases, turning Q10 ON. As a result, current is supplied from Q10 collector → R34 → R35 → base of Q11, turning Q11 ON. Consequently, current flows through R30, preventing the DC resistance of the unit from rising.

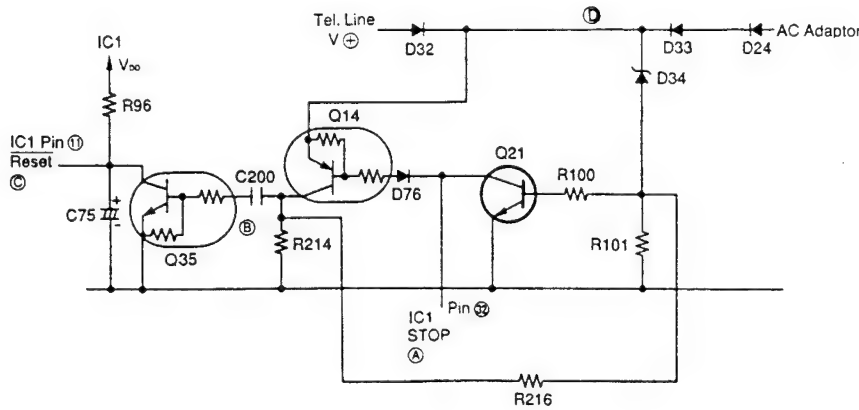
Circuit Diagram

■ RESET CIRCUIT

Function:
The reset circuit is a detection circuit which is used to detect the power supply voltage and apply a reset to the microprocessor when the circuit changes from an ON-HOOK status to an OFF-HOOK status.

Circuit Operation:
The reset conditions are as follows:
(1) When AC Adaptor into outlet.
(2) When the power give out:
ON-HOOK → OFF-HOOK
In the case of one above of conditions, a reset signal will be sent to the microprocessor (IC1).

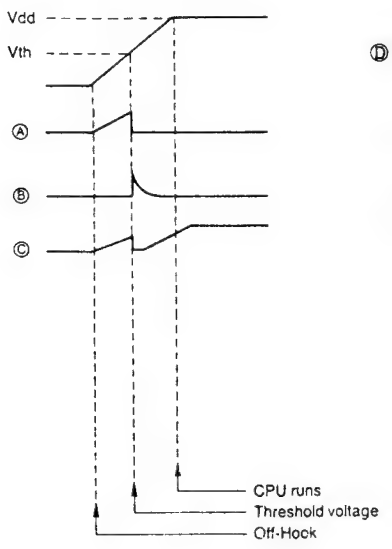
Circuit Diagram



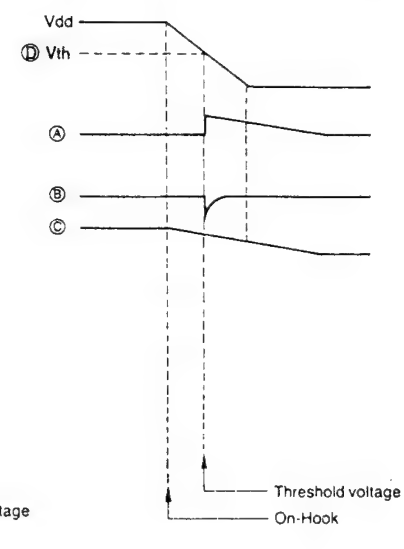
The timing chart for each of the points Ⓐ to Ⓓ, shown in the left circuit diagram is indicated below.
Regarding the resetting of Ⓒ, if the rise of the power supply voltage (Vcc) during an OFF- HOOK status without AC adaptor (or with Inserted AC adaptor) is such that the voltage at the power supply of the reset circuit rises by more than 2.7V determined by the zener voltage (+0.6 V) of D34.
Also, when the power supply voltage (Vcc) falls or there is no power supply voltage (Vcc) at the ON- HOOK status without AC adaptor (or with inserted ACadaptor), Ⓑwill STOP and become "H", resulting in a memory backup status (in order to reduce the drain on line, the oscillation of the microprocessor is stopped, thus resulting in only a small current flow).

Timing Chart

(1)At the OFF- HOOK condition without AC adaptor (or with inserted AC adaptor)



(2) At the ON-HOOK condition without AC adaptor (or with inserted AC adaptor)



■ INTERCOM DATA COMMUNICATION CIRCUIT

Function:
This is the circuit for execution of data exchange between KX-T3250s, for control of the intercom function, and for realization of the functions for IN-USE indication, hold cancellation, etc.

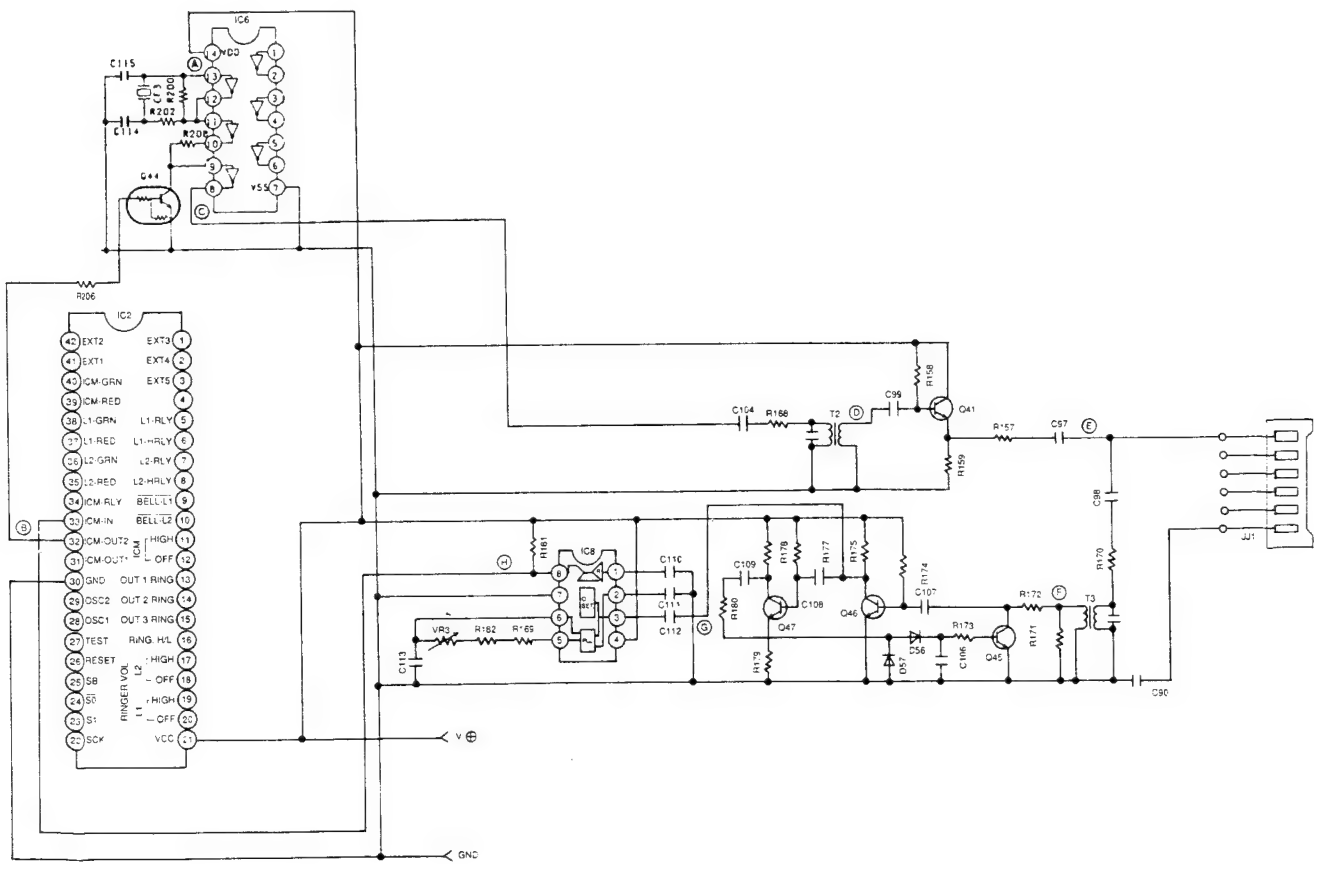
Circuit Operation:

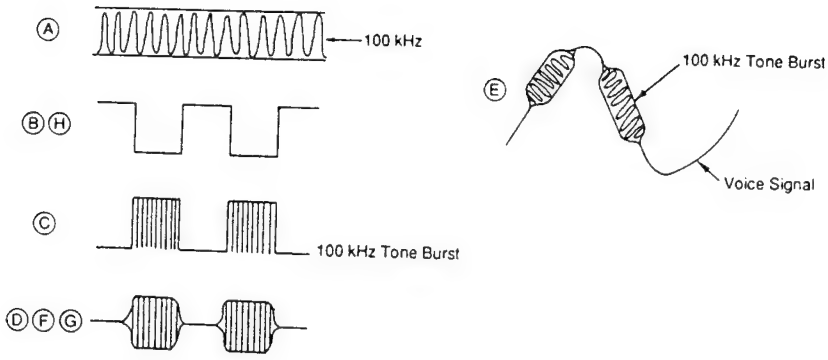
•Data Transmission Circuit
The 100 kHz oscillation of IC6 is controlled by the output from pin 32 of IC2, and output to the intercom line is made as a tone burst wave.
pin 13 of IC6 (100 kHz) oscillation → pin 11 of IC6 → pin 10 of IC6 → R208 → collector of Q44
pin 32 of IC2 (intercom communication data)→R206→base of Q44
→ pin 9 of IC6 → pin 8 of IC6 → C104, R168 → T2 → C99 → base of Q41 → emitter of Q41 → R157, C97 → intercom line.

•Data Reception Circuit
This is the circuit for amplification of the 100 Hz tone burst wave of the intercom line and conversion by IC8 to a digital signal.
1. Intercom line → C98, R170 → T3 → R172 → C107 → base of Q46 → collector of Q46 → C112 → pin 3 of IC8 (tone burst wave input)→pin 8 of IC8 (digital signal)→pin 33 of IC2
2. Collector of Q46→C108→base of Q47→collector of Q47→C109, R180→D56→R173→base of Q45

The ON resistance of Q45 is controlled by the above signal flow, and AGC operation is executed so that the level of the tone burst input signal entering at pin 3 of IC8 is kept constant by voltage splitting with R172.

Circuit Diagram





BELL DETECTION CIRCUIT AND BELL GENERATION CIRCUIT

Circuit Operation:

When the bell signal is received from the line , it passes through C12 (C13) and R7 (R8), then passes through D3, D8 (D4,D9), turning PC5 (PC6) ON. As a result, pin 9 (pin 10) of IC2 becomes Low level. The bell call signal is entered to pin 33 of IC2 via the intercom line. By this, the signals of the following table are put out from the pins13,14 and 15 of IC2, the oscillator is oscillated by IC6 and IC7, and the bell signal is produced .

	pin 14	pin 15	f H 1 (13 pin)	f H 2 (13 Pin)	f L
Line 1	H	L	526 Hz	639 Hz	16 Hz
Line 2	L	H	704 Hz	854 Hz	16 Hz
Intercom	H	H	990 Hz	1203 Hz	16 Hz

fH1 Line 1 $= 1/2.2 \times (C116 + C94) \times (R185 + R184)$
$1/2.2 \times (0.0056 + 0.0012) \times 10^{-6} \times (100 \times 10^3 + 27 \times 10^3) = 526$ Hz

fH2 Line 1 $= 1/2.2 \times (C116) \times (R185 + R184)$
$1/2.2 \times 0.0056 \times 10^{-6} \times (100 \times 10^3 + 27 \times 10^3) = 639$ Hz

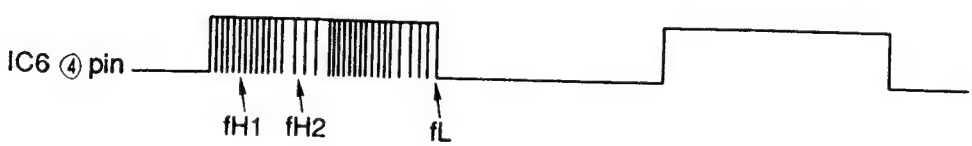
fH1 Line 2 $= 1/2.2 \times (C116 + C94) \times (R187 + R184)$
$1/2.2 \times (0.0056 \times 10^{-6} + 0.0012 \times 10^{-6}) \times (68 \times 10^3 + 27 \times 10^3) = 704$ Hz

fH2 Line 2 $= 1/2.2 \times C116 \times (R187 + R184)$
$1/2.2 \times 0.0056 \times 10^{-6} \times (68 \times 10^3 + 27 \times 10^3) = 854$ Hz

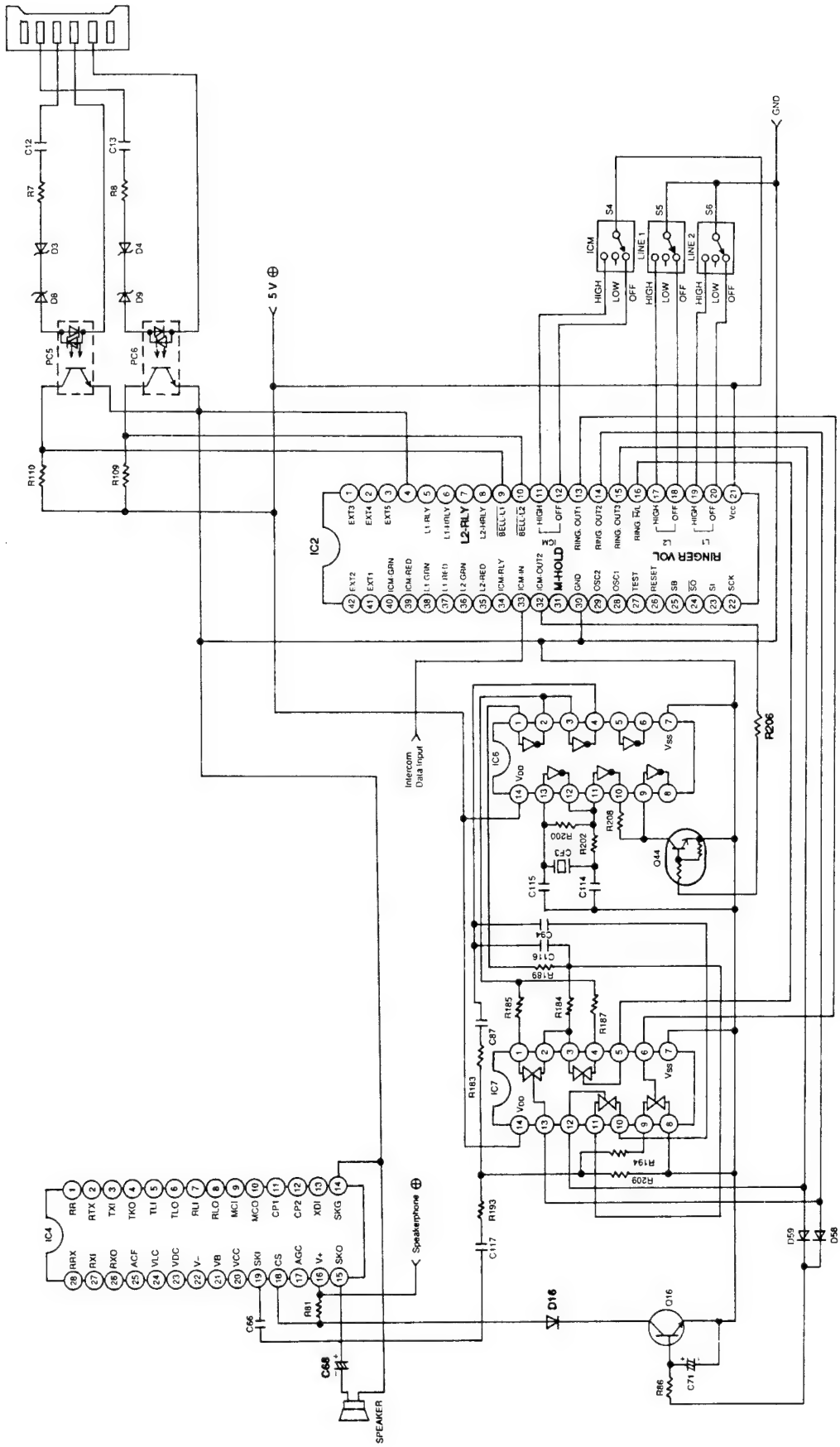
fH1 Intercom $= 1/2.2 \times (C116+C94) \times (R185//R187+R184)$
$1/2.2 \times (0.0056 \times 10^{-6} + 0.0012 \times 10^{-6}) \times (100 \times 10^3 // 68 \times 10^3 + 27 \times 10^3) = 990$ Hz

fH2 Intercom $= 1/2.2 \times C116 \times (R185//R187+R184)$
$= 1/2.2 \times 0.0056 \times 10^{-6} \times (100 \times 10^3 // 68 \times 10^3 + 27 \times 10^3) = 1203$ Hz

This tone passes through the following path: pin 4 of IC6 →C87→ R183→ R193 → C117 → C66 → pin 19 of IC4 →Speaker, the generated signal causing the tone ringer to produce a ringing tone.



Circuit Diagram



TONE DIAL CIRCUIT

Function:

The tone dialing circuit consists of a DTMF (Dual Tone Multi Frequency) signal generator (outputted from pin 37 of the microprocessor) for tone dialing, and also a circuit for outputting the signal to line.

The DTMF circuit indentifies inputs from the 12 keys (1, 2, 3, 4, 5, 6, 7, 8, 9, 0 ∗ and #) by mean of a total of seven frequencies; that is, four low frequencies (Low group) and three high frequencies (High group).

Circuit Operation:

When a dial key is pressed, a DTMF signal outputted from pin 37 of IC1 as an analog synthetic wave.

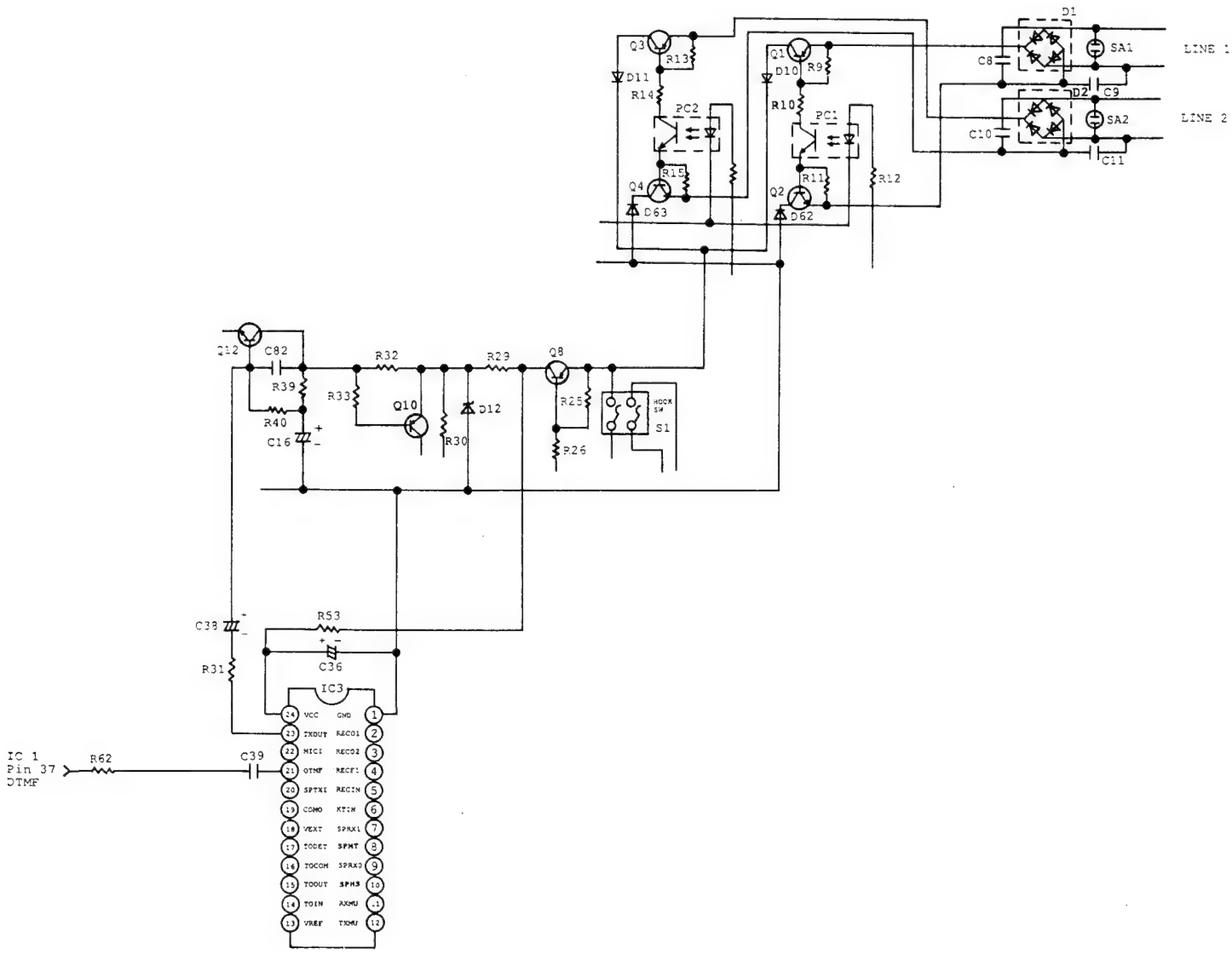
The signal flow to the line is as follows.

Pin 37 of IC1 → R62 → C39 →pin 21 of IC3 → pin 23 of IC3 → R31, C38 → base of Q12 → collector of Q12 → R32 → R29 → Q8 → D10 (D11) →D62 (D63) → Q1 (Q3), Q2 (Q4).

The DTMF signal is sent to the line via the following path.

The signal combination and frequency corresponding to each dial key is shown on page 22.

Circuit Diagram



Tone Frequencies

High Group / Low Group	H1	H2	H3
L1	1	2	3
L2	4	5	6
L3	7	8	9
L4	*	0	#

Low Group	Frequencies	High Group	Frequencies
L1	697 Hz± 1.5%	H1	1209 Hz± 1.5%
L2	770 Hz± 1.5%	H2	1336 Hz± 1.5%
L3	852 Hz± 1.5%	H3	1477 Hz± 1.5%
L4	941 Hz± 1.5%		

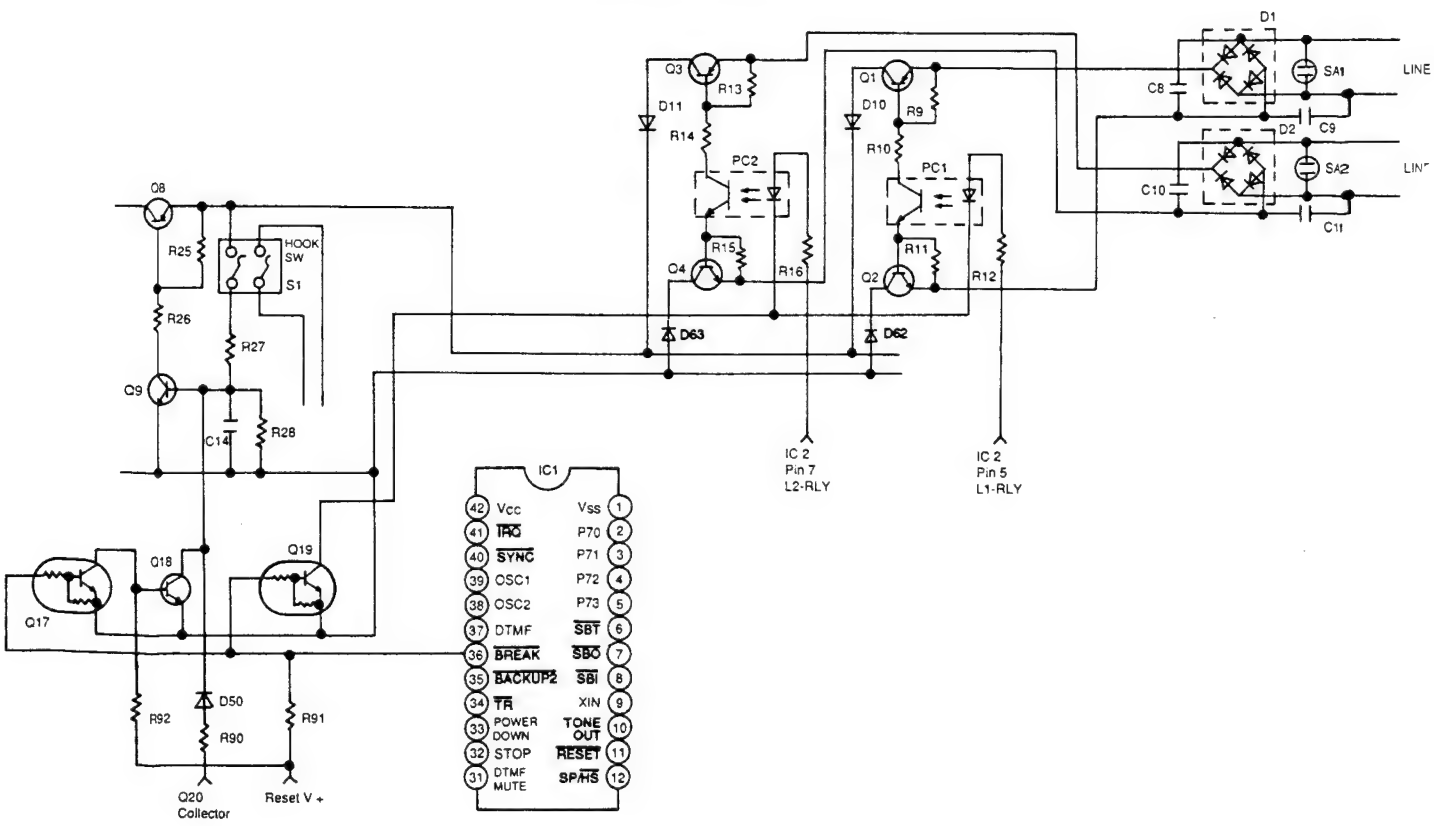
■ PULSE DIAL CIRCUIT

Circuit Operation:

The dial pulses are generated by the CPU (IC1), and reach the Telephone Line via the following path;

Pin 36 of IC1 → Q17 → Q18 → Q9 → Q8 → Line.
→ Q19 → Q1 and Q2 (Q3 and Q4)

Circuit Diagram



SPEAKERPHONE CIRCUIT

Function:
This circuit controls the automatic switching of the transmitted and received signals, to and from the Telephone Line when the unit is used in the hands-free mode.

Circuit Operation:
The Speakerphone can only provide a one-way communication path.
In other words, it can either transmit an outgoing signal or receive an incoming signal at a given time, but cannot do both simultaneously. Therefore, a switching circuit is necessary to control the flow of the outgoing and incoming signals. This switching circuit is contained in IC4 and consists of a Voice Detector, Tx Attenuator, Rx Attenuator, Comparator and Attenuator Control. The circuit analyzes whether the Tx (transmit) or the Rx (receive) signal is louder, and then it processes the signals such that the louder signal is given precedence.
The Voice Detector provides a DC input to the Attenuator Control corresponding to the Tx signal.
The Comparator receives a Tx and a Rx signal, and supplies a DC input to the Attenuator Control corresponding to the Rx signal. The Attenuator Control provides a control signal to the Tx and the Rx Attenuator to switch the appropriate signals ON and OFF. The Attenuator Control also detects the level of the volume control to automatically adjust for changing ambient conditions.

1) **Transmission Signal Path**
The unit signal from the microphone is sent through the circuit via the following path:
•Mic →C69→ pin 9 of IC4 → pin 10 of IC4 → VR2→ pin 3 of IC4 → pin 4 of IC4 →R67→ C51 → pin 20 of IC3 → pin 23 of IC3 → R31 → C38→ Interface(Q12) → Telephone Line.

2) **Reception Signal Path**
Signals received from the Telephone Line are outputted at the speaker via the following path:
•Telephone Line → Interface(Q12) →C17→R37→ R45 → C26 → pin 7 of IC3 → pin 9 of IC3 → R69 → C53 → pin 27of IC4 → pin 26 of IC4 → R79 → C66→ pin19 of IC4 → pin15 of IC4→ Speaker.

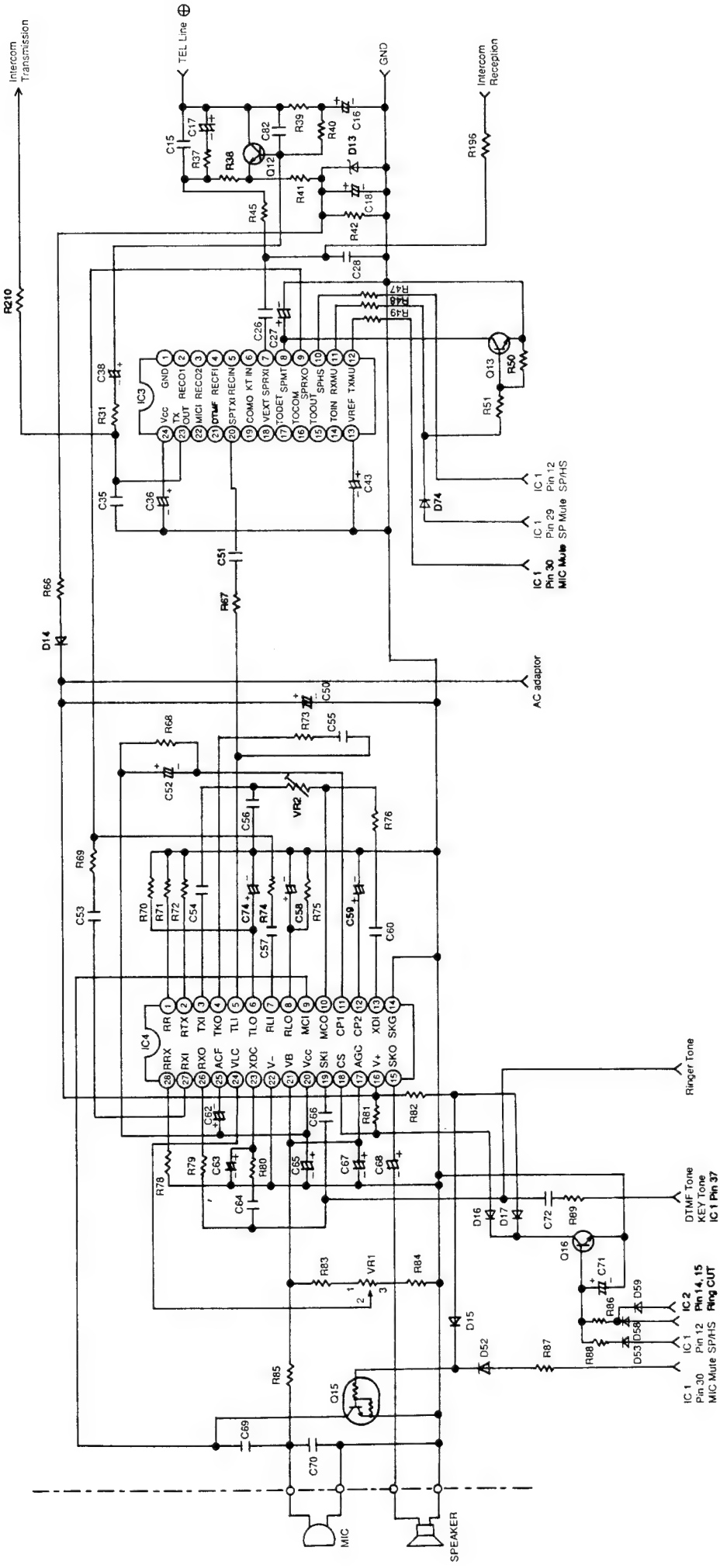
3) **Control Signal Path**
Control signals for transmission and reception are inputted to IC1 via the following path:
(Transmission Control Signal Path)
• Mic →pin 9 of IC4 → pin 10 of IC4 → VR2 → pin 3 of IC4 → pin 4 of IC4 → R73 → C55 → pin 5 of IC4.
(Reception Control Signal Path)
•Telephone Line →Interface(Q12) →C17→R37 → R45 →C26 → pin 7 of IC3 → pin 9 of IC3 → R74 →C57 → pin 7 of IC4.

4) **Transmission/Reception Switching**
The comparison result between Tx and Rx outputs as a DC level of IC4 pin 23.
Tx level is high...pin 23 = pin 20 - 6mV
Rx level is high...pin 23 = pin 20 - 150mV
Comparator output is connected to the attenuator control inside of IC4.

5) **Voice Detector**
The output of the Mic Amp (pin 10 of IC4) is supplied to pin 13 of IC4 as a control signal for the voice detector.

6) **Attenuator Control**
The attenuator control detects the setting of the volume control through pin 24 of IC4 to automatically adjust for changing ambient conditions

Circuit Diagram



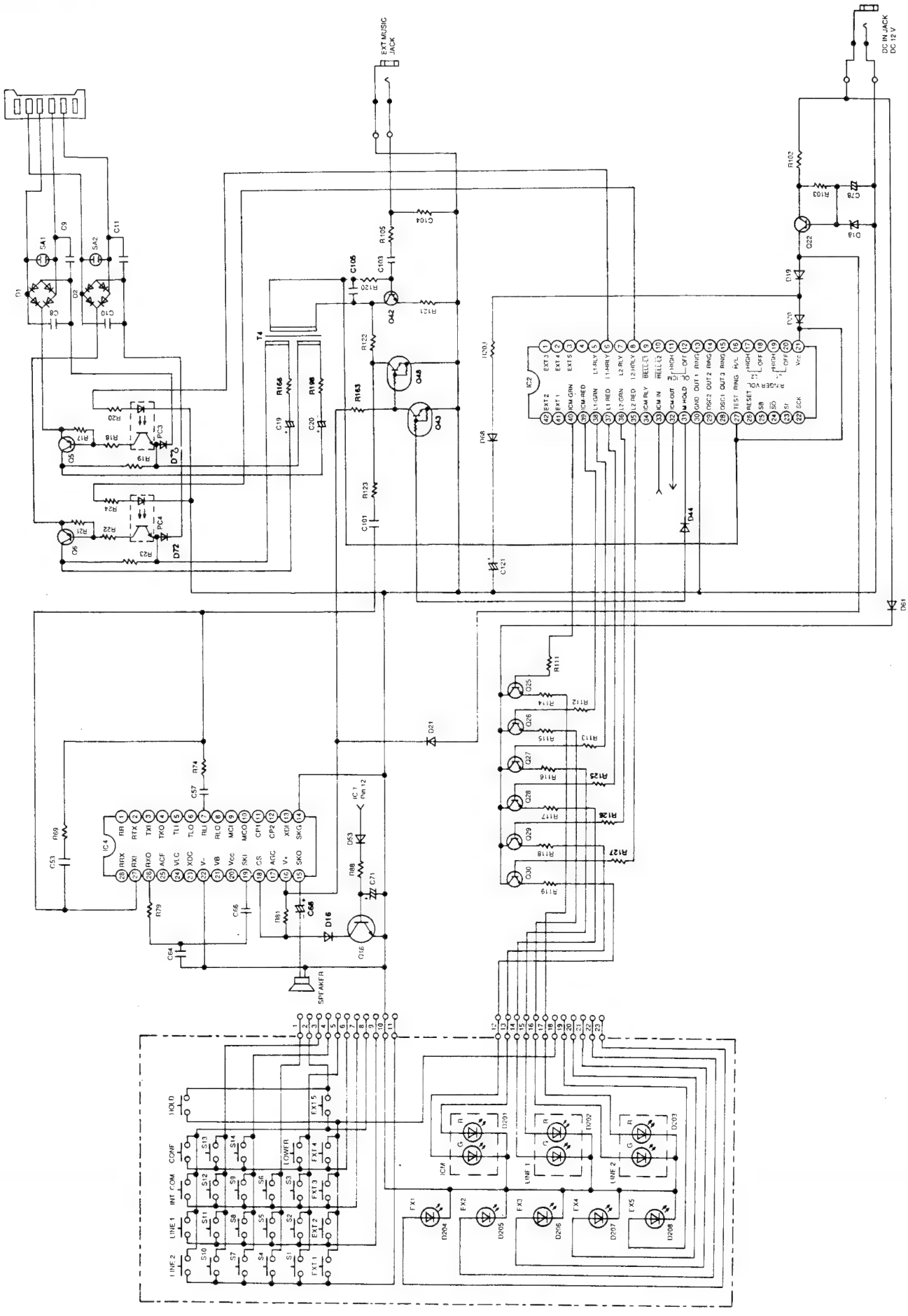
■ HOLD CIRCUIT

Function:
This circuit is designed to hold a line which is IN USE in the handset mode or speakerphone mode.
In this case, the LED indication will change from a steady glow to a flashing indication. There is also a further function available of EXT Music ON HOLD.

Circuit Operation: ( ) Line2
(Holding)
If the Hold key is pressed during a conversation using the handset or the speakerphone, the CPU IC1 and IC2 judges that a hold status has been applied, consequently pin 6 (pin 8) of IC2 becomes High level, and PC3 (PC4) goes ON.
Q5 (Q6) goes ON, and the line voltage is held by R19 (R23).
The EXT Music Tone input from EXT Music back is sent to the line. EXT Music Jack → R105 → C103 → base of Q42 → collector of Q42 → pin 2 of T4 → pin 4 (pin 5) of T4 → R198 (R166) → C20 (C19) → Line 1 (Line 2). When the set is On Hold, pin 31 of IC2 becomes High logic level.
This signal is output from the collector of Q42 → R122 → R123, C101 → pin 27 of IC4 → pin 15 of IC4 → Speaker.
Enabling the EXT Music Tone to be monitored from the Speaker .
Also, D202G (D203G) flashes slowly. At this time the HOLD signal has been executed, sent via the intercom line, and the D202R (D203R) of the KX-T3250 connected in parallel flashes slowly.

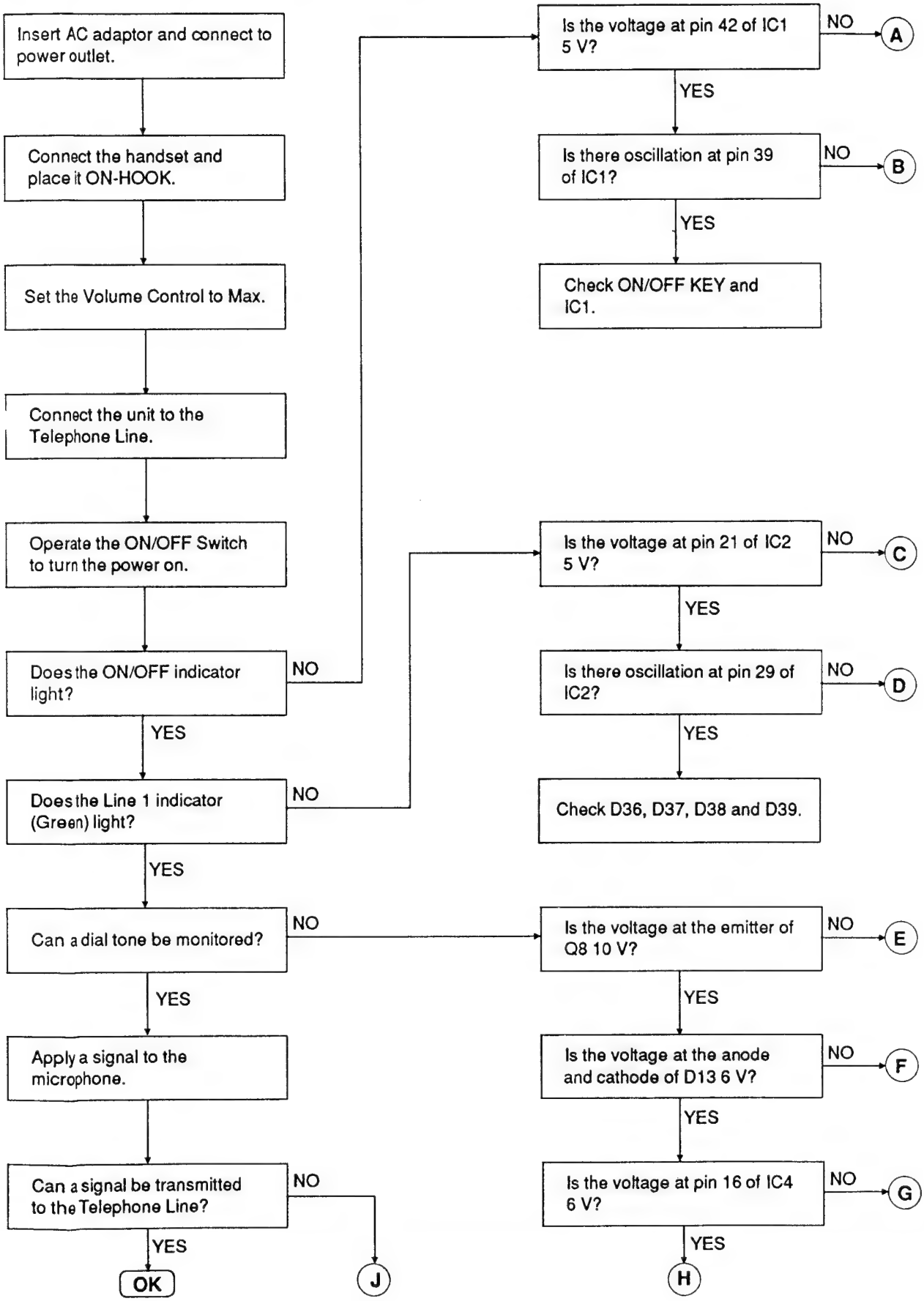
(Hold Cancellation)
If parallel-connected KX-T3250 is put into an OFF-HOOK status during a hold status. When the signal indicating that the KX-T3250 connected in parallel is in off-hook condition is received via the intercome line, causing the hold status to be canceled.
At this time, D202 (D203) goes out.

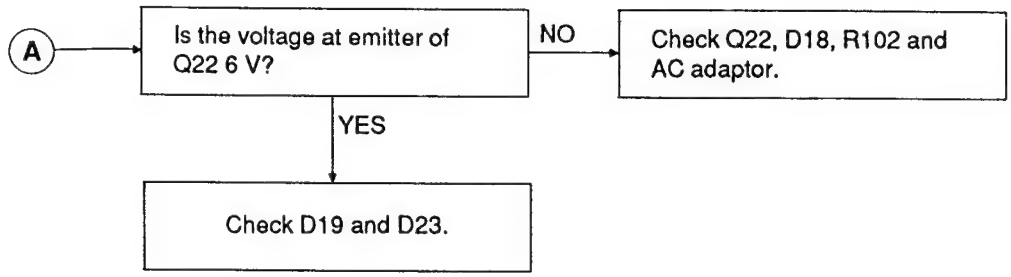
Circuit Diagram

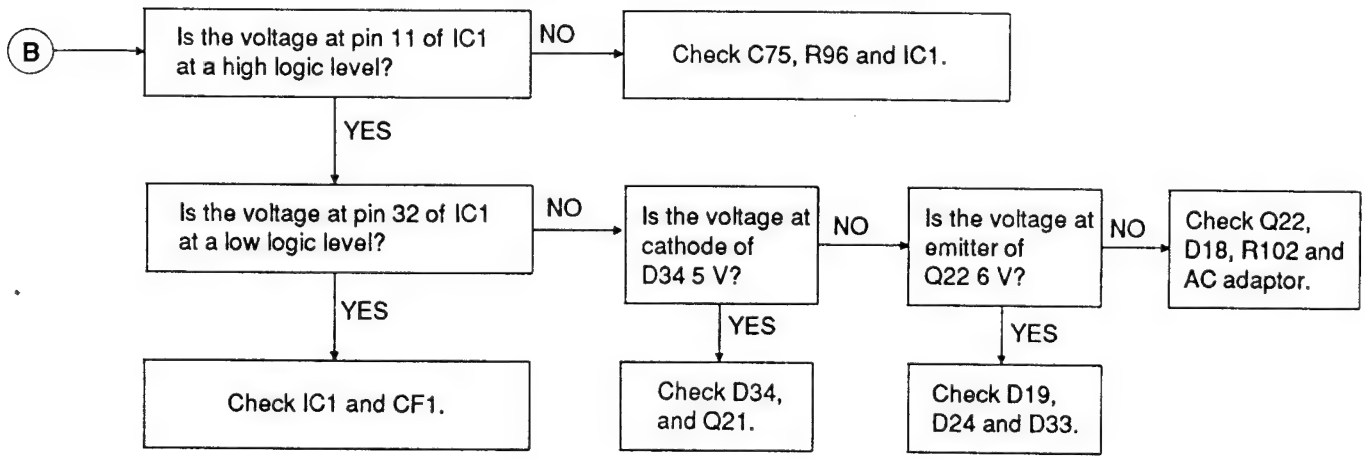


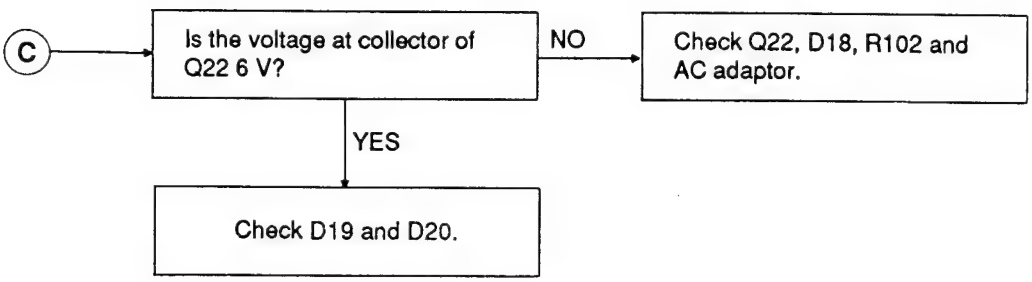
TROUBLE SHOOTING GUIDE

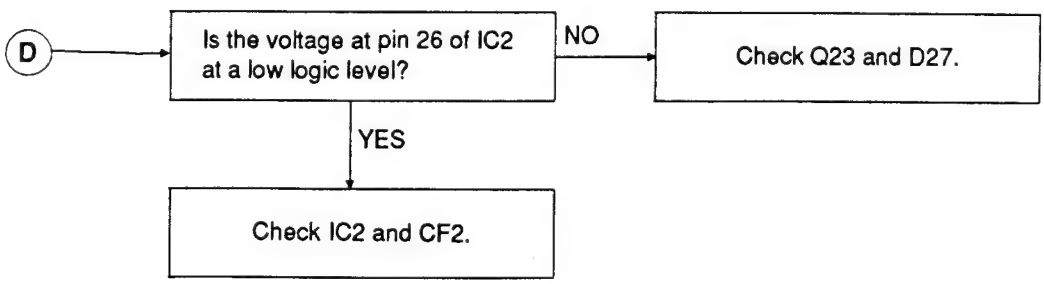
1. UNIT DOES NOT TURN ON ( ) Line 2

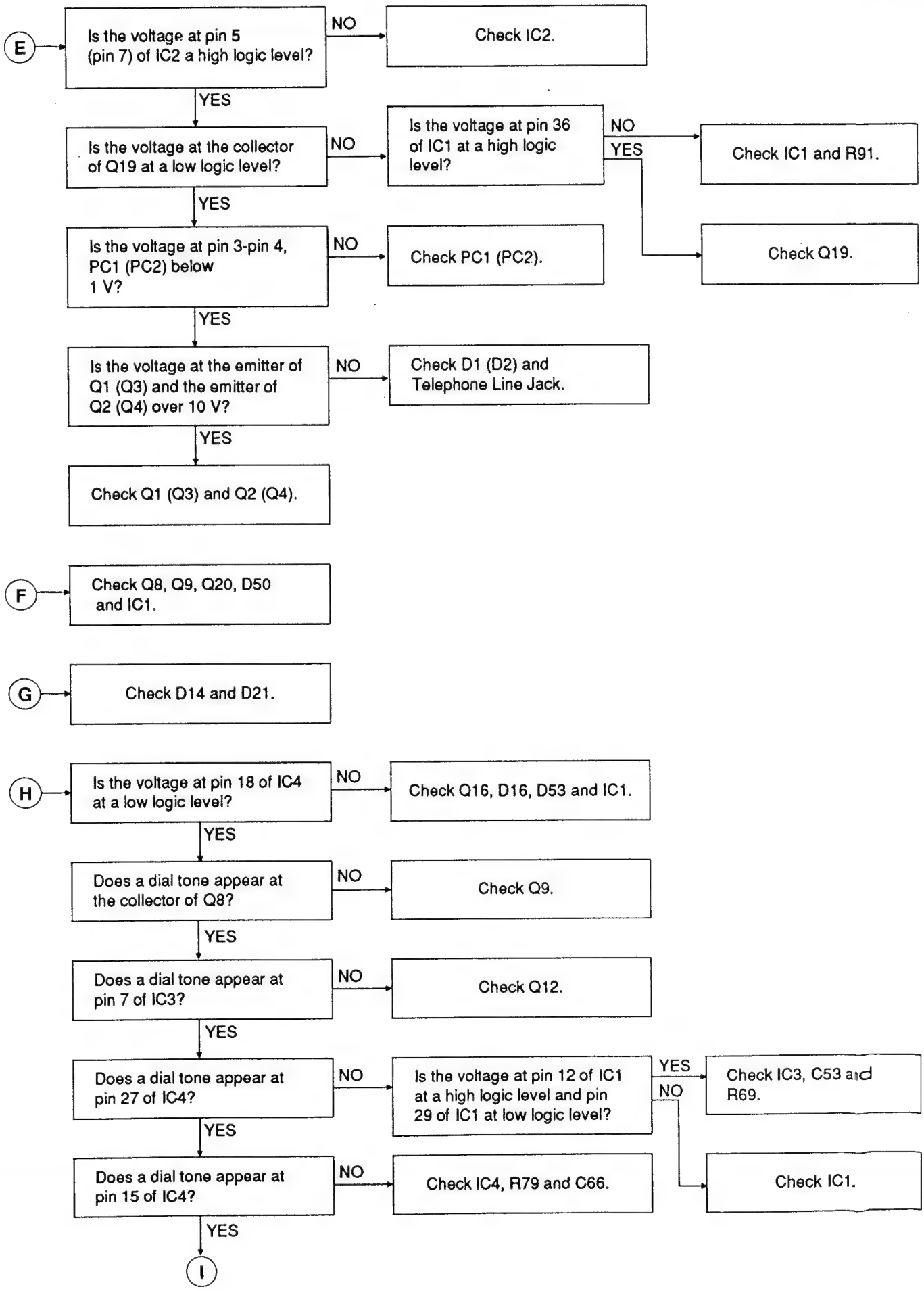


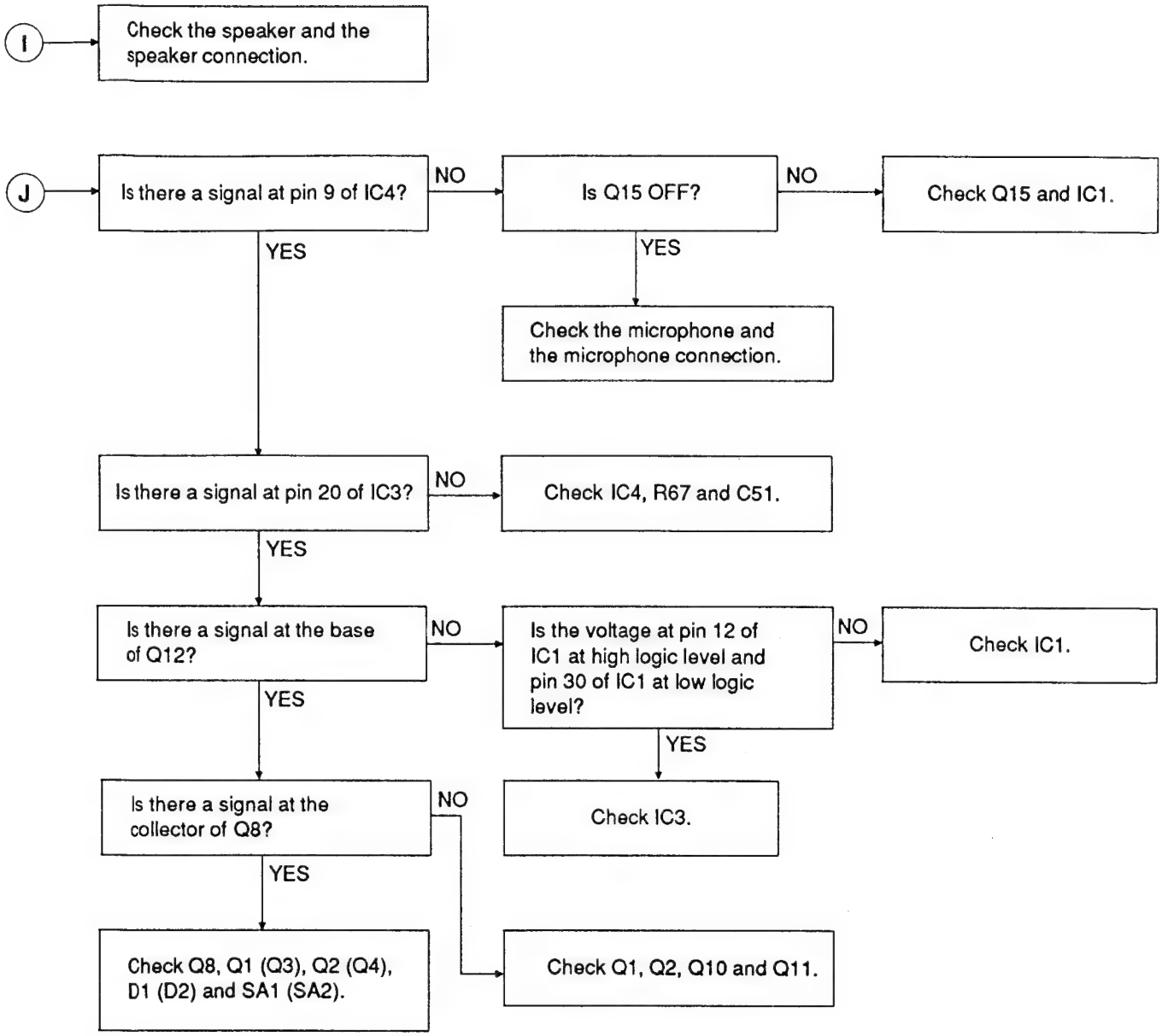

A
Is the voltage at emitter of Q22 6 V?
NO
Check Q22, D18, R102 and AC adaptor.
YES
Check D19 and D23.


B
Is the voltage at pin 11 of IC1 at a high logic level?
NO
Check C75, R96 and IC1.
YES
Is the voltage at pin 32 of IC1 at a low logic level?
NO
Is the voltage at cathode of D34 5 V?
NO
Is the voltage at emitter of Q22 6 V?
NO
Check Q22, D18, R102 and AC adaptor.
YES
Check IC1 and CF1.
YES
Check D34, and Q21.
YES
Check D19, D24 and D33.

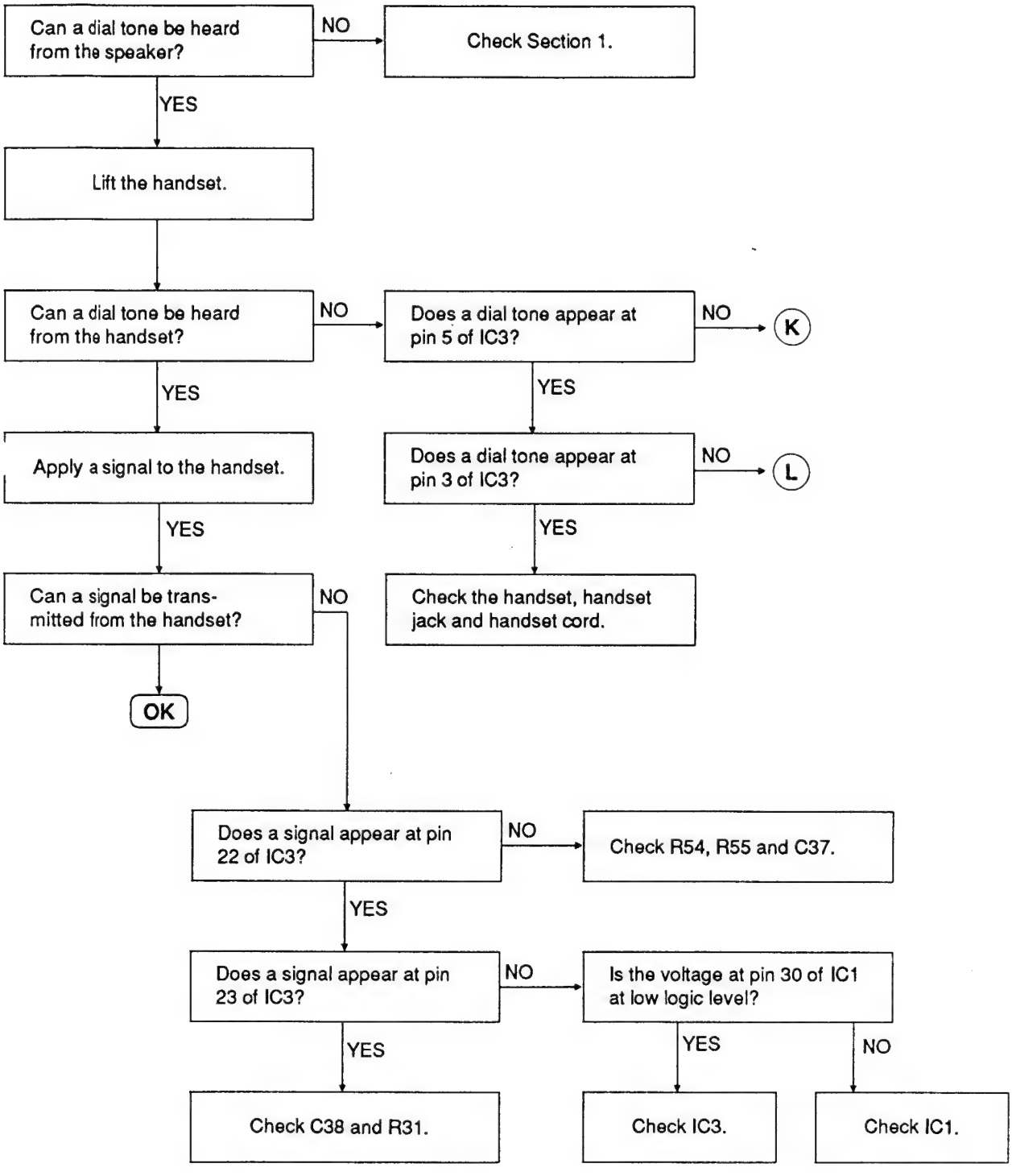

C
Is the voltage at collector of Q22 6 V?
NO
Check Q22, D18, R102 and AC adaptor.
YES
Check D19 and D20.

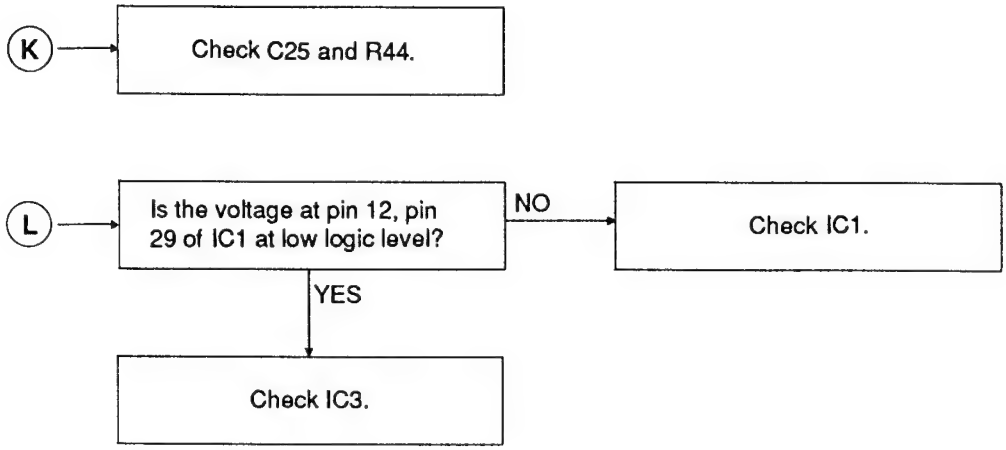

D
Is the voltage at pin 26 of IC2 at a low logic level?
NO
Check Q23 and D27.
YES
Check IC2 and CF2.


E
Is the voltage at pin 5 (pin 7) of IC2 a high logic level?
NO
Check IC2.
YES
Is the voltage at the collector of Q19 at a low logic level?
NO
Is the voltage at pin 36 of IC1 at a high logic level?
NO
YES
Check IC1 and R91.
YES
Is the voltage at pin 3-pin 4, PC1 (PC2) below 1 V?
NO
Check PC1 (PC2).
Check Q19.
YES
Is the voltage at the emitter of Q1 (Q3) and the emitter of Q2 (Q4) over 10 V?
NO
Check D1 (D2) and Telephone Line Jack.
YES
Check Q1 (Q3) and Q2 (Q4).
F
Check Q8, Q9, Q20, D50 and IC1.
G
Check D14 and D21.
H
Is the voltage at pin 18 of IC4 at a low logic level?
NO
Check Q16, D16, D53 and IC1.
YES
Does a dial tone appear at the collector of Q8?
NO
Check Q9.
YES
Does a dial tone appear at pin 7 of IC3?
NO
Check Q12.
YES
Does a dial tone appear at pin 27 of IC4?
NO
Is the voltage at pin 12 of IC1 at a high logic level and pin 29 of IC1 at low logic level?
YES
Check IC3, C53 and R69.
NO
YES
Does a dial tone appear at pin 15 of IC4?
NO
Check IC4, R79 and C66.
Check IC1.
YES
I

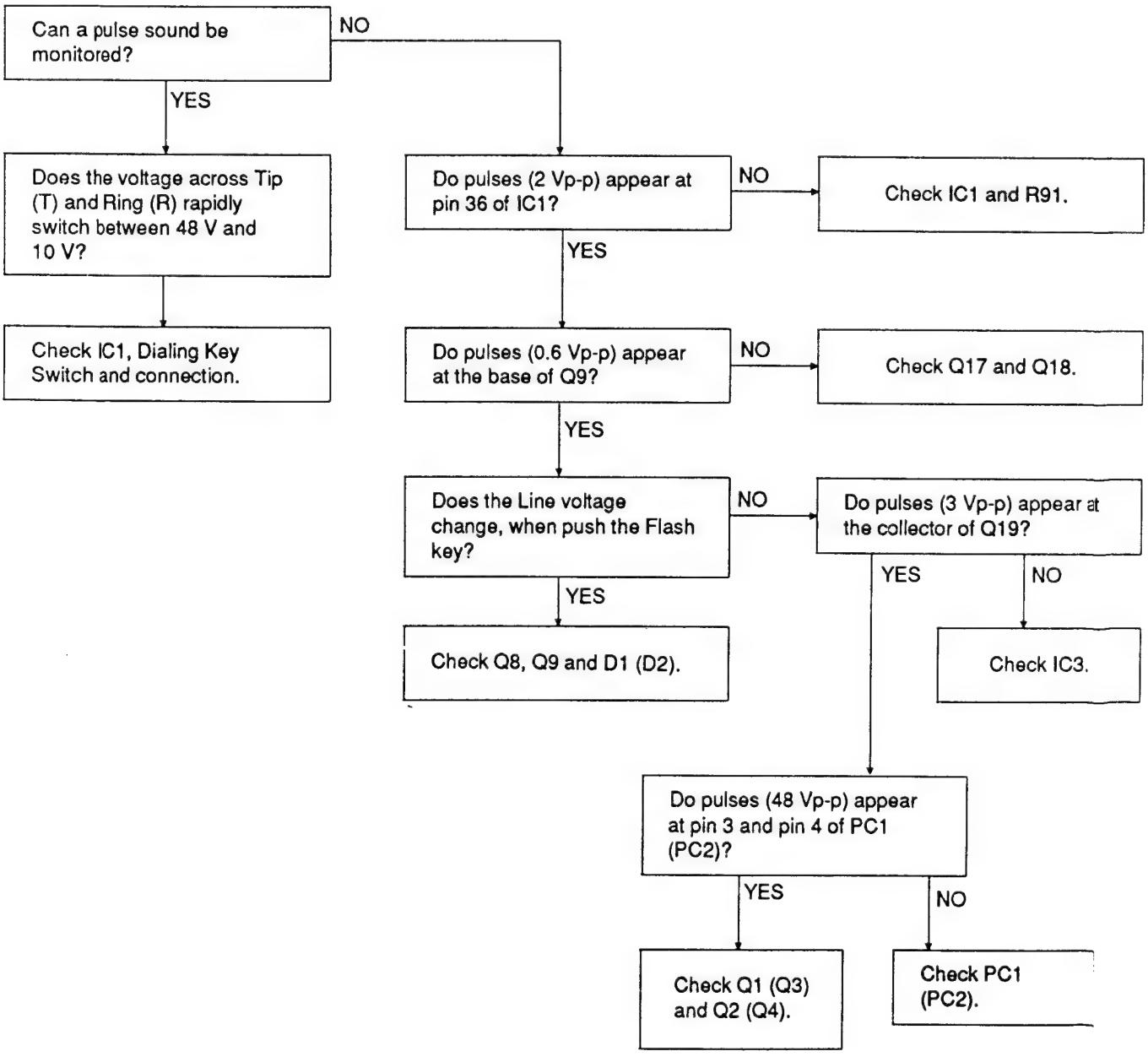

I
Check the speaker and the speaker connection.
J
Is there a signal at pin 9 of IC4?
NO
Is Q15 OFF?
NO
Check Q15 and IC1.
YES
YES
Check the microphone and the microphone connection.
Is there a signal at pin 20 of IC3?
NO
Check IC4, R67 and C51.
YES
Is there a signal at the base of Q12?
NO
Is the voltage at pin 12 of IC1 at high logic level and pin 30 of IC1 at low logic level?
NO
Check IC1.
YES
YES
Is there a signal at the collector of Q8?
NO
Check IC3.
YES
Check Q8, Q1 (Q3), Q2 (Q4), D1 (D2) and SA1 (SA2).
Check Q1, Q2, Q10 and Q11.

2. PROBLEMS WITH THE HANDSET

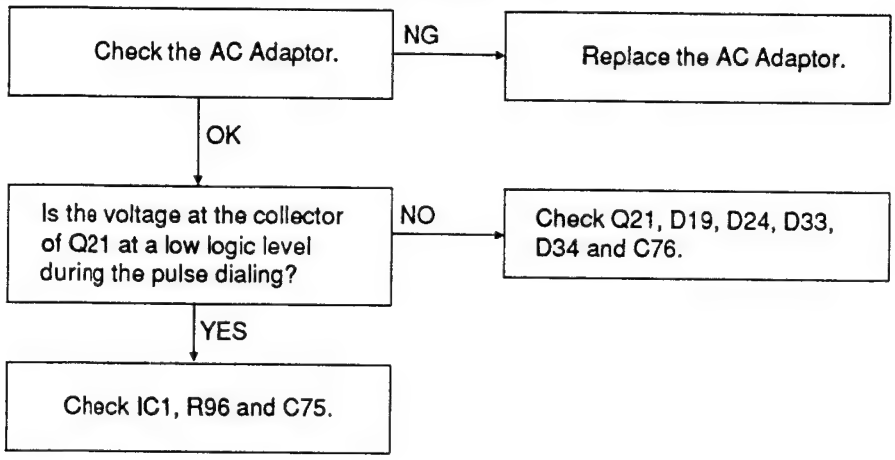




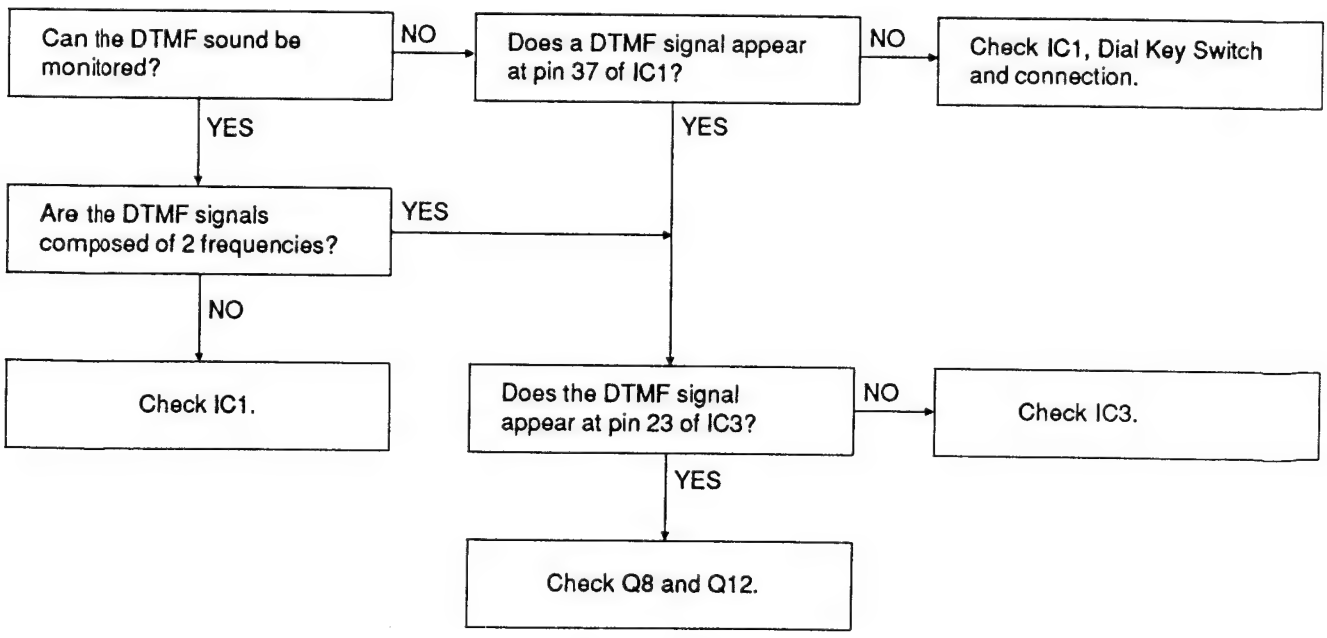
3. PULSE DIALING PROBLEMS



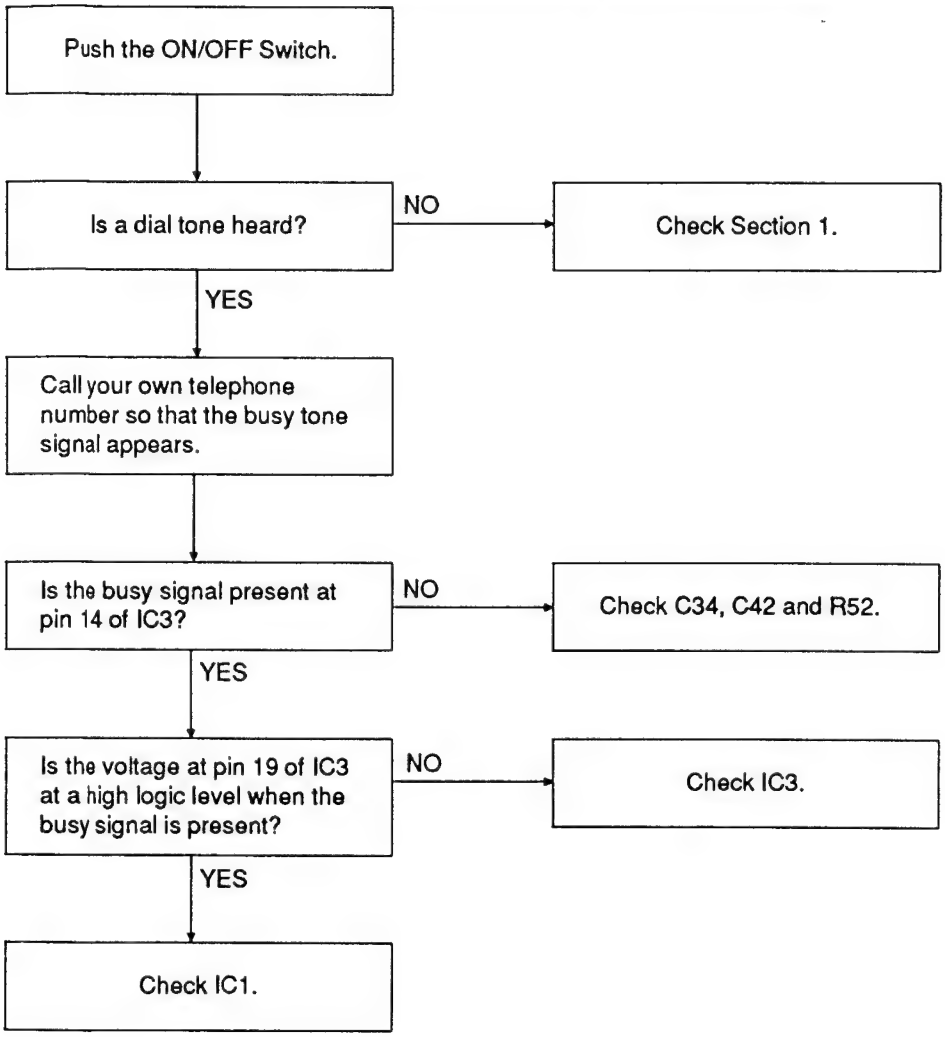
4. UNIT TURNS OFF WHEN PULSE DIALING



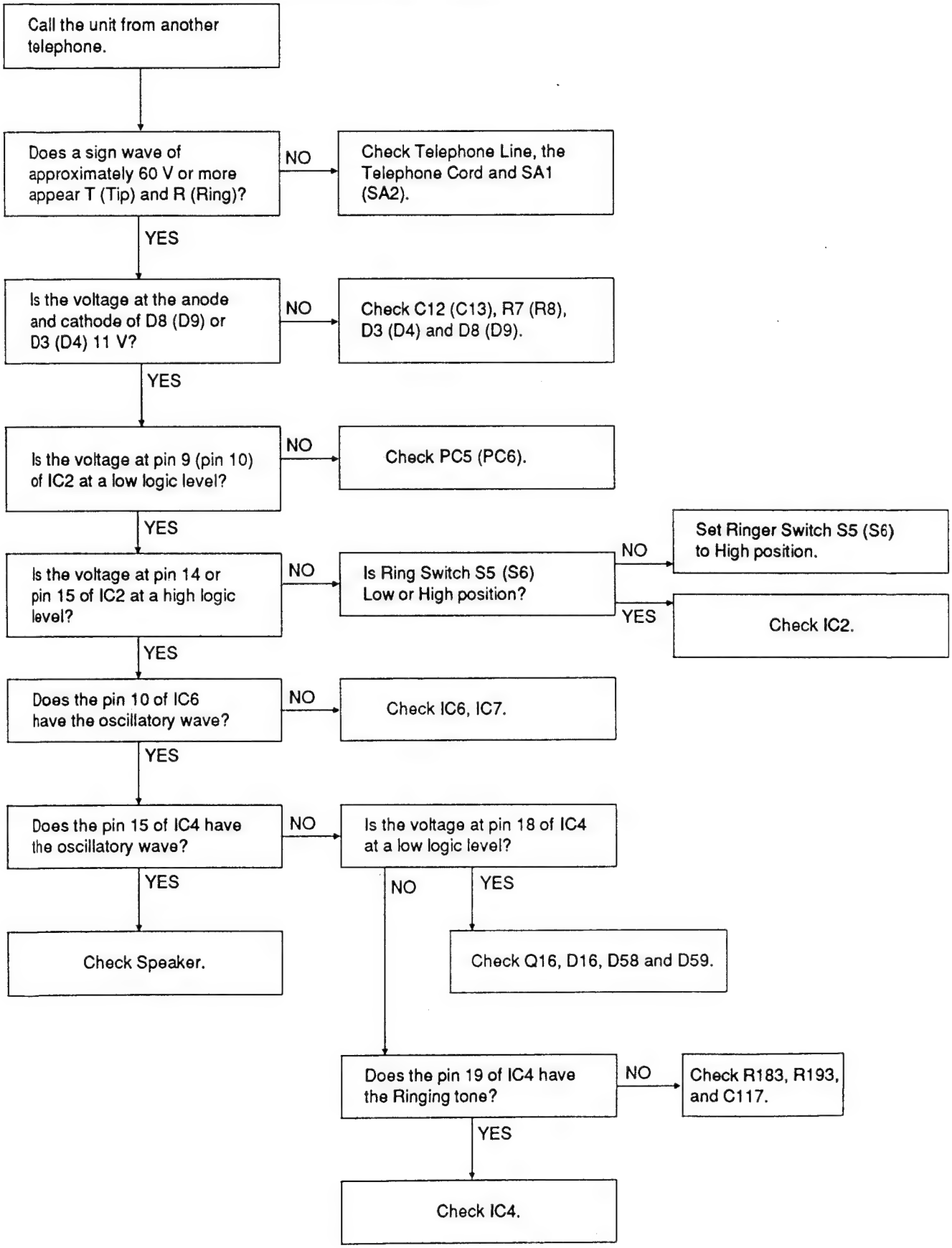
5. TONE DIALING PROBLEMS



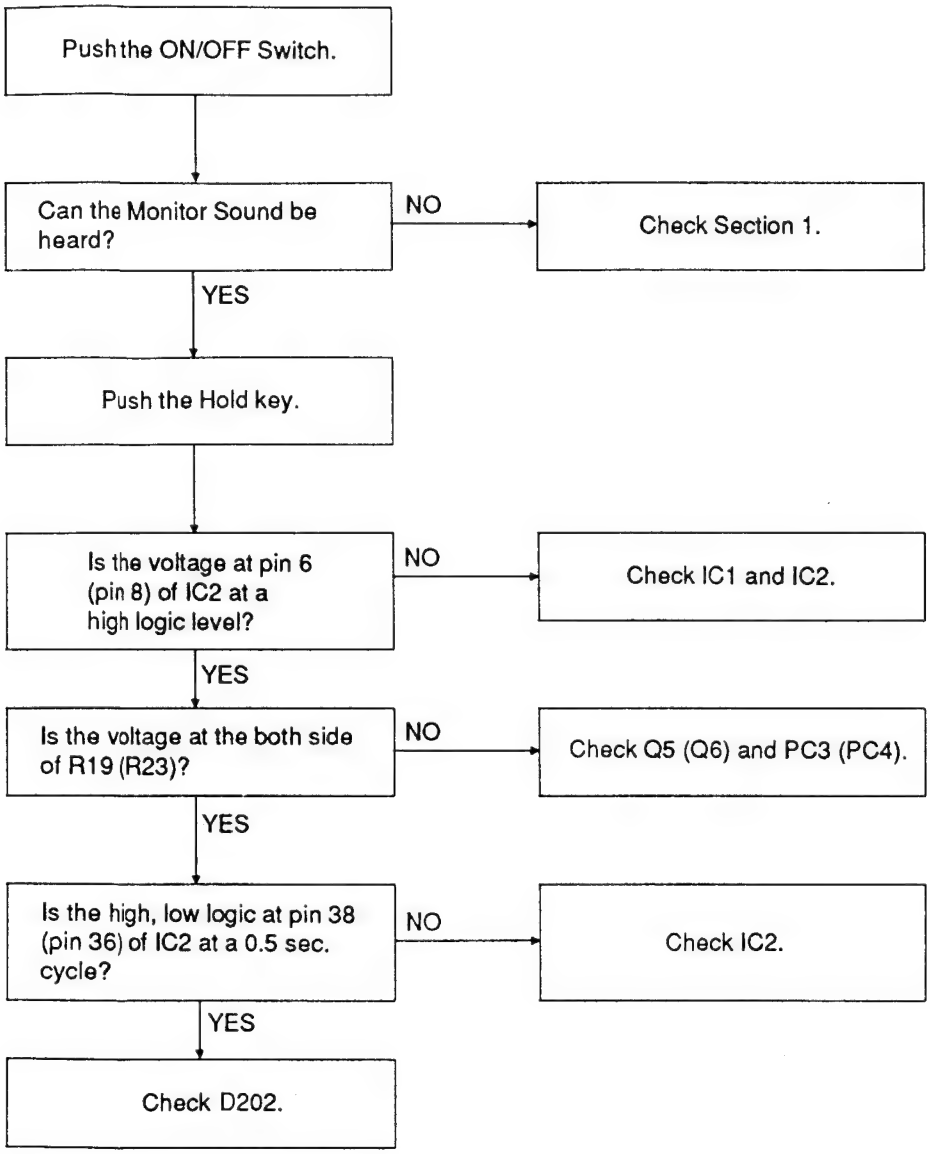
6. UNIT DOES NOT SHUT OFF AND/OR REDIAL WITH BUSY SIGNAL



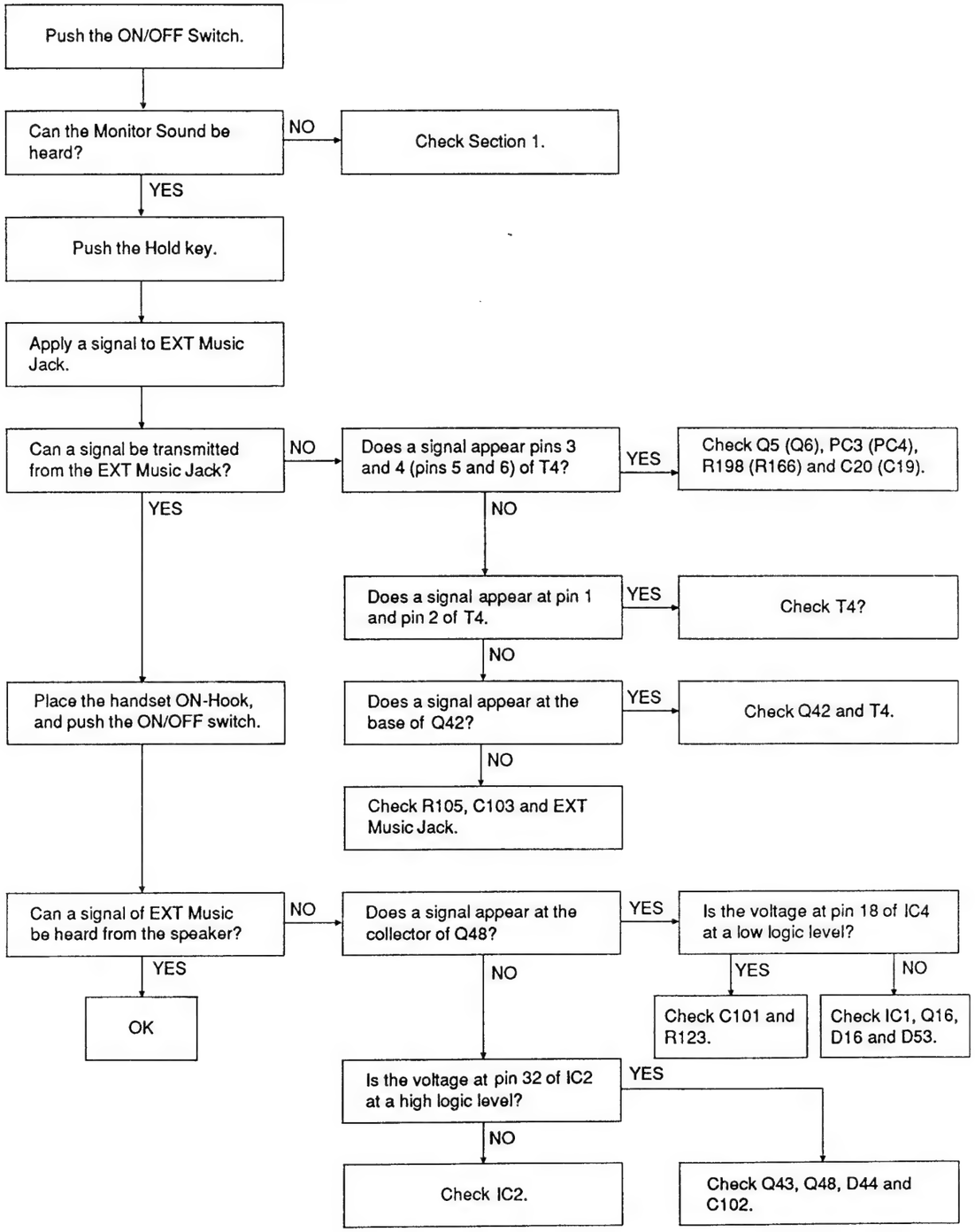
7. NO "RINGING" SOUND WHEN A RING SIGNAL IS INPUT



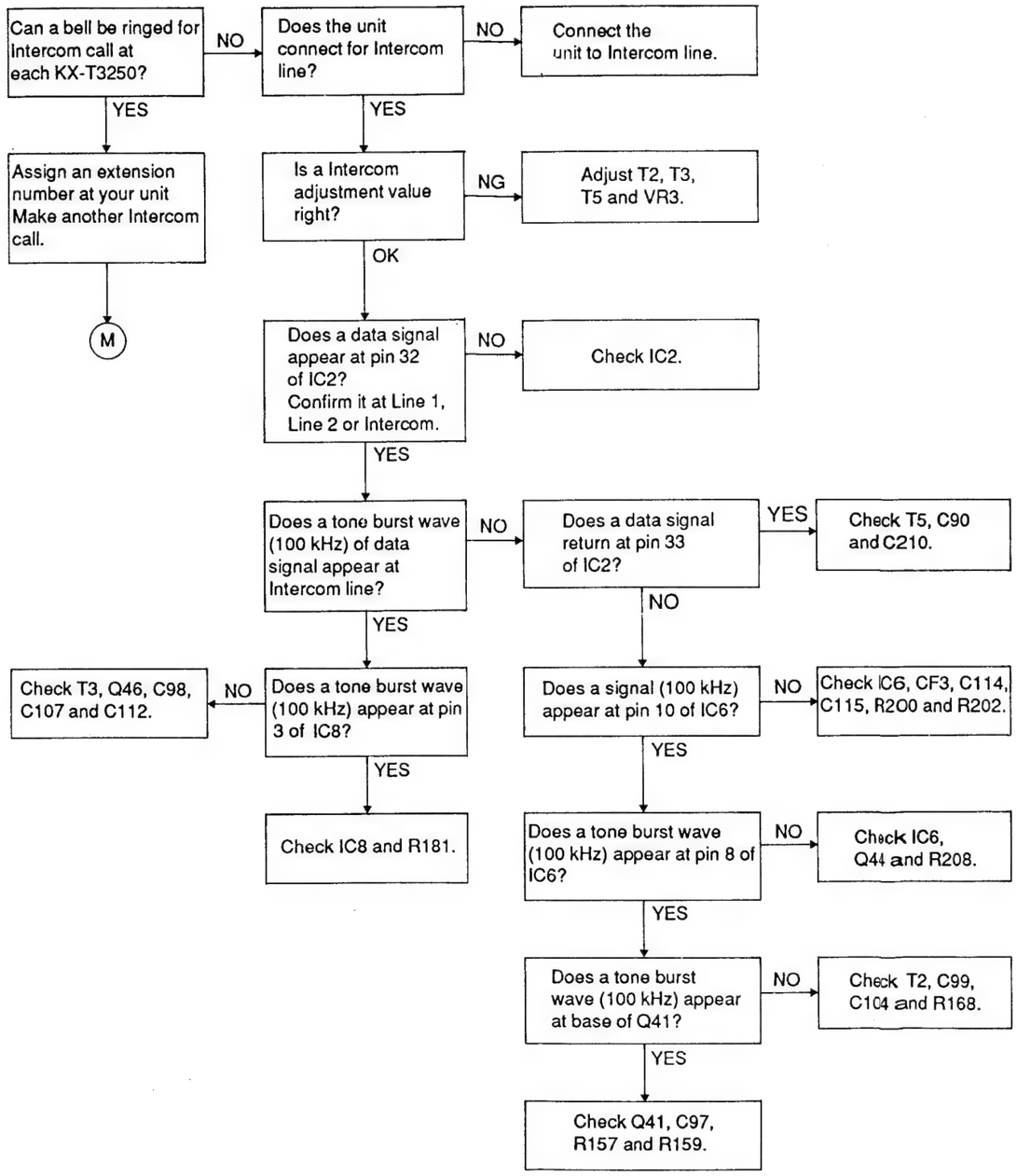
8. DOES NOT HOLD

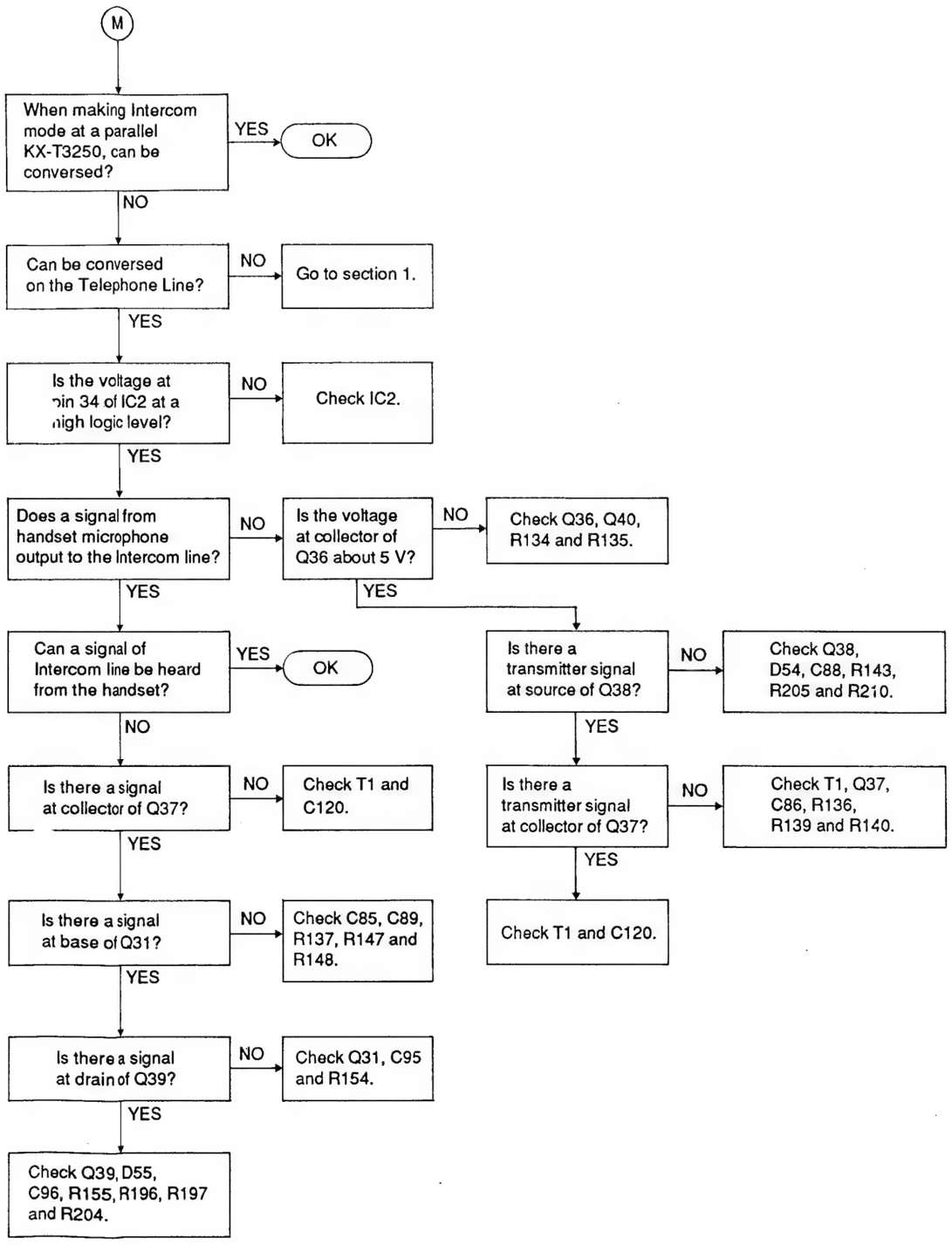


9. EXT MUSIC TONE DOES NOT WORK



10. DOES NOT INTERCOM OPERATION





CABINET AND ELECTRICAL PARTS LOCATION

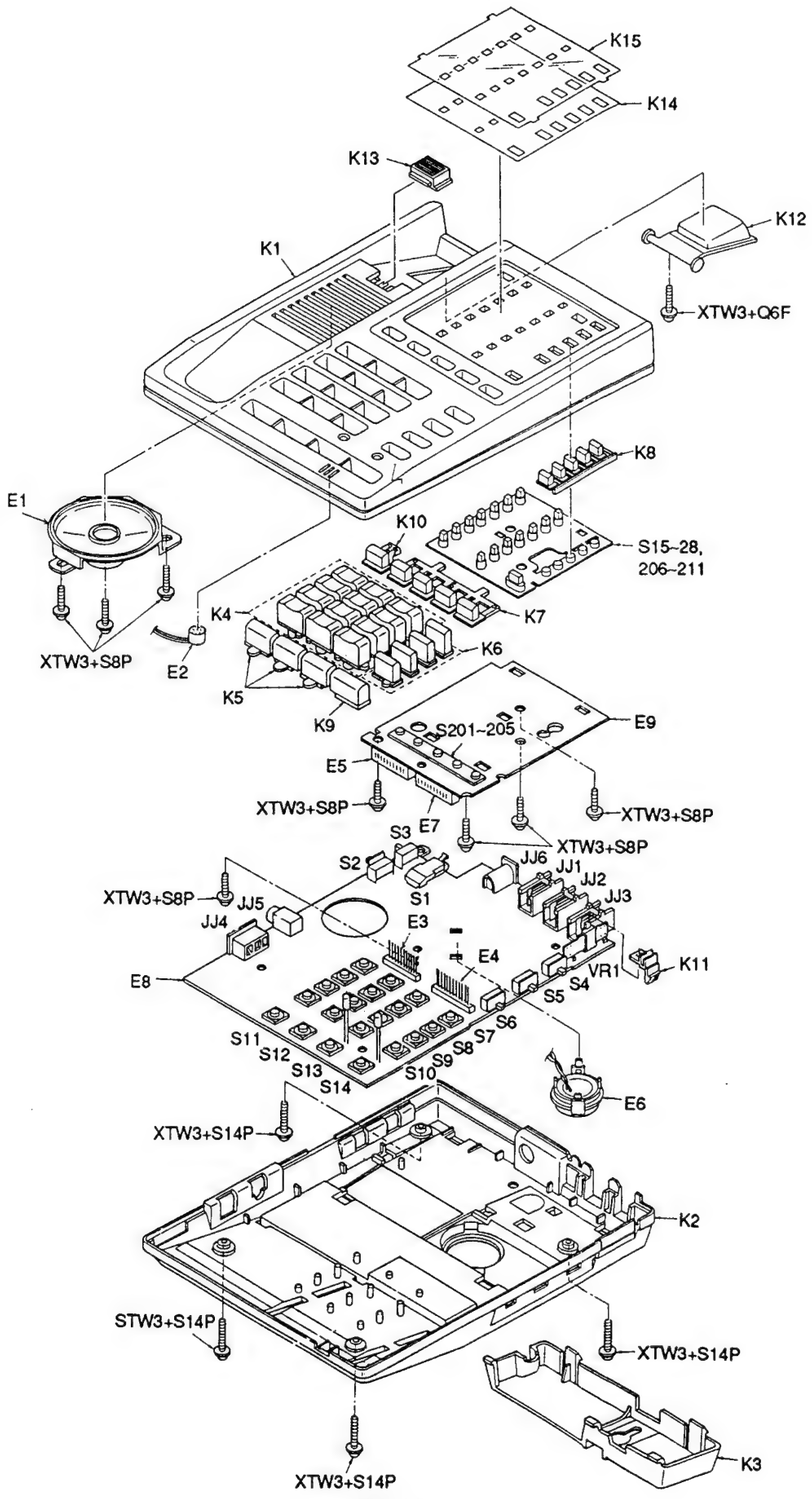


Fig. 11

REPLACEMENT PARTS LIST

Model KX-T3250

Notes:

1. Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.
2. Important safety notice.
   Components identified by the ⚠ mark special characteristics important for safety.
   When replacing any of these components, use only manufacture's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified.
   All resistors are in ohms(Ω) k=l000Ω,M=l000kΩ
   All capacitors are in MICRO FARADS(μF) P=μμF
   *Type &Wattage of Resistor
   Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12:1/2W	1:1W	2:2W	3:3W

*Type & Voltage of Capacitor
Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyster
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polyproplylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		0J:6.3V	1E,25:25V	2A :100V

Ref. No.	Part No.	Part Name & Description		Pcs
		ICs, TRANSISTORS & DIODES		
IC1	MN158413KTZ	IC		1
IC2	PQVI4240A12S	IC		1
IC3	AN6156K	IC		1
IC4	PQVISC77655S	IC		1
IC5	PQVIBA6565A	IC		1
IC6	PQVIPD4069UC	IC		1
IC7	PQVITC4066BP	IC		1
IC8	PQVIIR3N05	IC		1
IC9	PQVITC4SU69F	IC		1
Q1,3,8	2SA1626	Transistor (Si)	⚠	3
Q2,4	2SC3631	Transistor (Si)	⚠	2
Q5,6	2SA1625	Transistor (Si)	⚠	2
Q7	UN521	Transistor (Si)	⚠	1
Q9	2SD662B	Transistor (Si)	⚠	1
Q10 ,24,36	2SB1218A	Transistor (Si)		3
Q11	2SD637	Transistor (Si)		1
Q12	2SC2120	Transistor (Si)		1
Q13,16,18 ,21,23,25 26-31,,37 ,41,42,45 ,46,47	2SD1819A	Transistor (Si)	S	18
Q14,20,33	UN5113	Transistor (Si)	S	3
Q15,17,19 ,32,34,35 ,40,43,44	UN5213	Transistor (Si)	S	9
Q22	2SC2235	Transistor (Si)		1
Q38,39	2SK117	Transistor (Si)		2
Q48	PQVTBB1A4M	Transistor (Si)		1
D1,2,5	PQVDS1YB40F1	Diode (Si)	⚠	3
D,3,4,8,9	MA4110	Diode (Si)	⚠	4
D6,14-17, ,20-24,26 ,28-33, ,35-41,44-50 ,52-60,64-71 ,74,76	1SS131	Diode (Si)	⚠	50
D7	MA4300	Diode (Si)	⚠	1
D10,11,19 ,61-63,72,73	PQVDS5688G	Diode (Si)	⚠	8
D12	MA4180	Diode (Si)		1
D13	MA7062	Diode (Si)		1
D18	MA4068	Diode (Si)		1
D25	MA4062	Diode (Si)		1
D27	MA4047	Diode (Si)		1
D34	PQVD05AZ4.3	Diode (Si)		1
D42,43	LN28RPL	LED		2
D51	MA700	Diode (Si)		1
D201-203	LN02102C13LF	LED		3
D204-208	PQVDTLS221	LED		4
		SWITCHS		
S1	ESE14A211	Switch, Hook	⚠	1
S2	PQSS2A27W	Switch, Tone/Pulse		1
S3	PQSS2B18W	Switch, Power Failure Line Selector		1
S4-6	PQSS3A17W	Switch, Ringer Volume Selector	⚠	3
S7-14	PQSH1A33Z	Switch, 12Key, Page, Memo, Program, Pause, Speakerphone, Mute Redial, Flash		20
S15-28 ,206-211	PQSE97Z	Switch, Direct Call,Lower Station Extension		1
S201-205	PQSE88Z	Switch, Conferrence, Intercom Line, Hold		1
RLY1	PQSL58Z	Switch, Relay	⚠	1
		JACKS		
JJ1	PQJJ1TC3Y	Jack, L1/L2/INT'COM (6-wire)	⚠	1
JJ2	PQJJTB15Z	Jack, L1/L2 (4-wire)	⚠	1
JJ3	PQJJ1TA11Z	Jack, L2 (2-wire)	⚠	1
JJ4	PQJJ1TB10Z	Jack, Handset		1
JJ5	PQJJ1D5Z	Jack, EXT Music		1
JJ6	PQJJ1B4Y	Jack, DC IN		1
		TRANSFORMERS		
T1	PQLT8D2A	Transmission Transfermer		1
T2,3,5	EIR7QG019A	Harmonic Transformer		3
T4	PQLT2D7A	Interface Transformer		1
		OTHERS		
VR1	PQVAL204B24A	Volume Control, 20kΩ(B)		1
VR2	PQNB3A00B24M	Semi-Fixed Resistor, 20kΩ(B)		1
VR3	PQNB3A00B23M	Semi-Fixed Resistor, 2kΩ(B)		1
CF1	PQVBT3.58G1	Ceramic Filter		1
CF2	PQVBA419M1	Ceramic Filter		1
CF3	PQVCL100N5Z	Ceramic Filter		1
PC1-4	PQVIPC851K	Photo Coupler	⚠	4
PC5,6	PQVIPC814K	Photo Coupler	⚠	2
SA1,2	PQVDSAE310F1	Varistor (Surge Absorber)	⚠	1
		CABINET PARTS		
K1	PQKM154V8	Upper Cabinet		1
K2	PQYFT3250M	Lower Cabinet Ass'y		1
K3	PQYLT3250M	Stand Ass'y		1
K4	PQBCX71Z	Button, 12Key		1
K5	PQBCX72Z	Button, Redial, Flash, Mute		1
K6	PQBCX74Z	Button, Pase, Program, Memo, Page		1
K7	PQBCX83Y	Button, Intercom, Line, Hold		1
K8	PQBCX96Z	Button, Extension		1
K9	PQBC187Z	Button, Speakerphone		1
K10	PQBC200Z1	Button, Conference		1
K11	PQBD102Y	Knob, Speaker Volume		1
K12	PQBE19Z	Button, Hook		1
K13	PQKE46Z1	Handset Holder		1
K14	PQHP5018Z	Memory Card		1
K15	PQHR5128Z	Transparent Cover		1

Ref. No.	Part No.	Part Name & Description	Pcs
		ELECTRICAL PARTS	
E1	PQAS65P06V	Speaker	1
E2	PQJM117Z	Microphone	1
E3	PQJP11D14Z	Connector, 11P	1
E4	PQJP12D8Z	Connector, 12P	1
E5	PQJS11B30Z	Connector, 11P	1
E6	PQWHT3250M	Buzzer Ass'y	1
E7	PQJS12B30Z	Connector, 12P	1
E8	PQWP1T3250M	Printed Circuit Board (NLA)	1
E9	PQWP2T3250M	Printed Circuit Board (NLA)	1
		HANDSET	
H1	PQJX2PE403Y	Handset Ass'y	1
H1-1	PQKM121Y81	Lower Cabinet	1
H1-2	PQKF104Z81	Upper Cabinet	1
H1-3	PQAX4P03Z	Earpiece Speaker	1
H1-4	PQWMJX403Y	Mouthpiece Microphone	1
H1-5	PQHM32Y	Weight	1
H1-6	PQHG695W	Rubber Cap	2
		ACCESSORIES	
A1	KX-A09	AC Adaptor ⚠	1
A2	PQJA59Y	Telephone Cord (2-wire) S	1
A3	PQJA30T	Handset Cord	1
A4	PQJA48Y	Telephone Cord (4-wire)	1
A5	PQJA72Y	Telephone Cord (6-wire)	1
A6	PQQX5628Z	Instruction Book	1
		PACKING MATERIALS	
P1	PQPK651Z	Gift Box	1
P2	PQPN838Y	Pad	1
P3	XZB28X40A01	Protection Cover	1

Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
		RESISTORS			
R1	ERDS1TJ682	6.8k ⚠	R32	ERD16TJ100	10
R2	PQ4R10XJ123	12k	R33	PQ4R10XJ101	100
R3	PQ4R10XJ334	330k	R34	PQ4R10XJ472	4.7k
R4	PQ4R10XJ124	120k	R35	PQ4R10XJ472	4.7k
R5	PQ4R10XJ472	4.7k	R36	PQ4R10XJ103	10k
R6	PQ4R10XJ472	4.7k ⚠	R37	PQ4R10XJ821	820
R7	PQ4R10XJ473	47k ⚠	R38	PQ4R10XJ330	33
R8	PQ4R10XJ473	47k ⚠	R39	PQ4R10XJ562	5.6k
R9	PQ4R10XJ104	100k ⚠	R40	PQ4R10XJ103	10k
R10	ERD16TJ472	4.7k ⚠	R41	ERD16TJ150	15
R11	PQ4R10XJ104	100k ⚠	R42	ERD16TJ152	1.5k
R12	PQ4R10XJ102	1k ⚠	R43	PQ4R10XJ101	100
R13	PQ4R10XJ104	100k ⚠	R44	PQ4R10XJ683	68k
R14	ERD16TJ472	4.7k ⚠	R45	PQ4R10XJ682	6.8k
R15	PQ4R10XJ104	100k ⚠	R46	PQ4R10XJ153	15k
R16	PQ4R10XJ102	1k ⚠	R47	ERD16TJ473	47k
R17	PQ4R10XJ104	100k ⚠	R48	PQ4R10XJ473	47k
R18	ERD16TJ472	4.7k ⚠	R49	PQ4R10XJ473	47k
R19	PQRD2VJ391	390 ⚠	R50	PQ4R10XJ104	100k
R20	PQ4R10XJ102	1k ⚠	R51	PQ4R10XJ104	100k
R21	PQ4R10XJ104	100k ⚠	R52	PQ4R10XJ103	10k
R22	ERD16TJ472	4.7k ⚠	R53	PQ4R10XJ821	820
R23	PQRD2VJ391	390 ⚠	R54	PQ4R10XJ223	22k
R24	PQ4R10XJ102	1k ⚠	R55	PQ4R10XJ182	1.8k
R25	PQ4R10XJ104	100k ⚠	R56	PQ4R10XJ394	390k
R26	ERD25TJ472	4.7k ⚠	R57	PQ4R10XJ562	5.6k
R27	PQ4R10XJ683	68k ⚠	R58	PQ4R10XJ104	100k
R28	PQ4R10XJ104	100k ⚠	R59	PQ4R10XJ225	2.2M
R29	ERDS1TJ220	22	R60	ERD16TJ565	5.6M
R30	ERDS1TJ101	100	R61	ERD16TJ335	3.3M
R31	PQ4R10XJ472	4.7k	R62	PQ4R10XJ224	220k

Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
		RESISTORS			
R63	PQ4R10XJ101	100	R140	PQ4R10XJ682	6.8k
R64	PQ4R10XJ104	100k	R141	ERC14GK226	22M ⚠
R65	PQ4R10XJ103	10k	R143	PQ4R10XJ223	22k ⚠
R66	PQ4R10XJ4R7	4.7	R144	ERD16TJ474	470k ⚠
R67	ERD16TJ473	47k	R145	ERD25TJ106	10M
R68	PQ4R10XJ104	100k	R146	PQ4R10XJ105	1M
R69	PQ4R10XJ223	22k	R147	PQ4R10XJ103	10k
R70	PQ4R10XJ225	2.2M	R148	PQ4R10XJ103	10k
R71	ERD16TJ303	30k	R149	PQ4R10XJ125	1.2M
R72	PQ4R10XJ683	68k	R150	PQ4R10XJ472	4.7k
R73	PQ4R10XJ332	3.3k	R151	PQ4R10XJ101	100
R74	PQ4R10XJ333	33k	R152	PQ4R10XJ473	47k
R75	PQ4R10XJ275	2.7M	R153	PQ4R10XJ473	47k
R76	PQ4R10XJ472	4.7k	R154	PQ4R10XJ682	6.8k
R77	ERD16TJ105	1M	R155	PQ4R10XJ223	22k
R78	ERD16TJ183	18k	R156	PQ4R10XJ105	1M
R79	PQ4R10XJ222	2.2k	R157	PQ4R10XJ102	1k
R80	PQ4R10XJ104	100k	R158	PQ4R10XJ224	220k
R81	PQ4R10XJ473	47k	R159	PQ4R10XJ471	470
R82	PQ4R10XJ472	4.7k	R161	PQ4R10XJ332	3.3k
R83	PQ4R10XJ152	1.5k	R163	ERD16TJ332	3.3k
R84	PQ4R10XJ473	47k	R164	PQ4R10XJ104	100k
R85	PQ4R10XJ222	2.2k	R166	ERD16TJ272	2.7k
R86	PQ4R10XJ473	47k	R168	PQ4R10XJ222	2.2k
R87	PQ4R10XJ103	10k	R169	PQ4R10XJ222	2.2k
R88	PQ4R10XJ103	10k	R170	PQ4R10XJ472	4.7k
R89	PQ4R18XJ334	330k	R172	PQ4R10XJ150	15
R90	PQ4R10XJ473	47k	R173	PQ4R10XJ103	10k
R91	PQ4R10XJ223	22k	R174	PQ4R10XJ185	1.8M
R92	PQ4R10XJ473	47k	R175	PQ4R10XJ222	2.2k
R93	PQ4R10XJ224	220k	R177	PQ4R10XJ824	820k
R94	PQ4R10XJ152	1.5k	R178	PQ4R10XJ102	1k
R95	ERD16TJ152	1.5k	R179	PQ4R10XJ101	100
R96	PQ4R10XJ104	100k	R180	PQ4R10XJ125	1.2M
R97	PQ4R10XJ104	100k	R181	PQ4R10XJ472	4.7k
R98	PQ4R10XJ104	100k	R182	PQ4R10XJ682	6.8k
R99	PQ4R10XJ100	10	R183	PQ4R10XJ104	100k
R100	PQ4R10XJ103	10k	R184	ERD16TJ273	27k
R101	PQ4R10XJ392	3.9k	R185	PQ4R10XJ104	100k
R102	ERDS1TJ220	22	R187	PQ4R10XJ683	68k
R103	ERD16TJ471	470	R189	ERD16TJ101	100
R104	ERD16TJ682	6.8k	R190	PQ4R10XJ104	100k
R105	ERD16TJ183	18k	R191	PQ4R10XJ474	470k
R106	PQ4R10XJ224	220k	R192	PQ4R10XJ334	330k
R107	PQ4R10XJ474	470k	R193	ERD16TJ104	100k
R108	PQ4R10XJ104	100k	R194	PQ4R10XJ183	18k
R109	PQ4R10XJ223	22k	R195	PQ4R10XJ105	1M
R110	PQ4R10XJ223	22k	R196	PQ4R10XJ473	47k
R111	PQ4R10XJ103	10k	R197	PQ4R10XJ564	560k
R112	PQ4R10XJ103	10k	R198	PQ4R18XJ272	2.7k
R113	PQ4R10XJ103	10k	R199	PQ4R10XJ104	100k
R114	PQ4R10XJ221	220	R200	ERD16TJ825	8.2M
R115	PQ4R10XJ221	220	R202	PQ4R10XJ224	220k
R116	PQ4R10XJ221	220	R203	ERD16TJ100	10
R117	PQ4R10XJ221	220	R204	PQ4R10XJ223	22k
R118	PQ4R10XJ221	220	R205	ERD16TJ223	22k
R119	PQ4R10XJ221	220	R206	PQ4R18XJ103	10k
R120	PQ4R10XJ105	1M	R207	PQ4R10XJ103	10k
R121	PQ4R10XJ101	100	R208	PQ4R10XJ103	10k
R122	PQ4R10XJ105	1M	R209	PQ4R10XJ474	470k
R123	PQ4R10XJ105	1M	R210	PQ4R10XJ472	4.7k
R125	PQ4R10XJ103	10k	R211	PQ4R10XJ104	100k
R126	PQ4R10XJ103	10k	R212	PQ4R10XJ104	100k
R127	PQ4R10XJ103	10k	R213	PQ4R10XJ104	100k
R128	PQ4R10XJ221	220	R214	PQ4R10XJ473	47k
R129	PQ4R10XJ221	220	R215	PQ4R10XJ562	5.6k
R130	ERD25TJ221	220	R216	PQ4R10XJ223	22k
R131	PQ4R10XJ221	220	R253	ERD16TJ223	22k
R132	ERD25TJ221	220	R254	ERD16TJ223	22k
R133	PQ4R10XJ332	3.3k			
R134	PQ4R10XJ103	10k			
R135	PQ4R10XJ103	10k			
R136	PQ4R10XJ154	150k			
R137	PQ4R10XJ821	820			
R138	PQ4R10XJ330	33			
R139	PQ4R10XJ150	15			

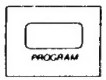
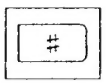
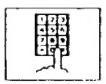
Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
CAPACITORS					
C1	ECQE2105KF	1 ⚠	C67	ECEA0JK221	220
C2	ECEA1HKS100	10 ⚠	C68	ECEA1CK101	100
C3	ECEA1HKSR22	0.22	C69	ECUV1H104MD	0.1
C4	ECQG1H822JZ	0.0082	C70	PQCUV1H103KB	0.01
C5	PQCUV1H471JC	470P	C71	ECEA1CKS220	22
C6	ECKD2H681KB	680P ⚠	C72	ECUV1H103KB	0.01
C7	ECKD2H681KB	680P ⚠	C73	PQCUV1H102J	0.001
C8	ECKD2H681KB	680P ⚠	C74	ECEA1HKS010	1
C9	ECKD2H681KB	680P ⚠	C75	ECEA1HKSR22	0.22
C10	ECKD2H681KB	680P ⚠	C76	ECEA1CK101	100
C11	ECKD2H681KB	680P ⚠	C77	ECEA0JU471	470
C12	ECQE2224KF	0.22 ⚠	C78	ECEA1CK101	100
C13	ECQE2224KF	0.22 ⚠	C79	EECW0HS473Z	0.047F
C14	PQCUV1H103KB	0.01 ⚠	C80	ECEA0JU331	330
C15	PQCUV1E333MD	0.033	C81	ECEA1HKS010	1
C16	ECEA1HKS3R3	3.3	C82	PQCUV1H681JC	680P
C17	ECEA1EK470	47	C83	ECEA1CKS100	10
C18	ECEA0JU471	470	C84	PQCUV1H223KB	0.022
C19	ECEA1HKS010	1	C85	ECEA1EK470	47
C20	ECEA1HKS010	1	C86	ECEA1HKS010	1
C21	PQCUV1H103KB	0.01	C87	PQCUV1H103KB	0.01
C22	PQCUV1E473MD	0.047	C88	ECEA1HKS010	1
C23	PQCUV1C683MD	0.068	C89	ECUV1H104MD	0.1
C24	PQCUV1H472KB	0.0047	C90	ECUV1H561KB	560P
C25	PQCUV1H682KB	0.0068	C91	PQCUV1E473MD	0.047
C26	PQCUV1E473MD	0.047	C92	PQCUV1H102J	0.001
C27	ECEA1HKS010	1	C93	PQCUV1H100DC	10P
C28	PQCUV1H472KB	0.0047	C94	ECQG1H122JZ	0.0012
C29	PQCUV1E473MD	0.047	C95	ECFD1C104KD	0.1
C30	PQCUV1H103KB	0.01	C96	ECEA1HKS010	1
C31	PQCUV1H103KB	0.01	C97	PQCUV1H561JC	560P
C32	ECEA1CKS100	10	C98	PQCUV1H561JC	560P
C34	ECQV1H473JZ	0.047	C99	PQCUV1H102J	0.001
C35	PQCUV1E153MD	0.015	C101	ECFD1C104KD	0.1
C36	ECEA0JK221	220	C103	ECFD1C104KD	0.1
C37	PQCUV1E153MD	0.015	C104	PQCUV1H103KB	0.01
C38	ECEA1HKS010	1	C105	PQCUV1H331JC	330P
C39	PQCUV1E473MD	0.047	C106	ECUV1H104MD	0.1
C40	ECEA1HKS010	1	C107	PQCUV1H103KB	0.01
C41	ECQG1H152JZ	0.0015	C108	PQCUV1H102J	0.001
C42	ECQV1H473JZ	0.047	C109	PQCUV1H103KB	0.01
C43	ECEA1CK101	100	C110	PQCUV1H103KB	0.01
C44	ECEA1CKS100	10	C111	PQCUV1H472KB	0.0047
C45	PQCUV1H103KB	0.01	C112	PQCUV1H103KB	0.01
C46	PQCUV1H103KB	0.01	C113	ECQG1H102JZ	0.001
C47	ECQG1H103JZ	0.01	C114	PQCUV1H470JC	47P
C48	PQCUV1C683MD	0.068	C115	PQCUV1H150JC	15P
C49	ECEA0JU102	1000	C116	ECQG1H562JZ	0.0056
C51	PQCUV1H102J	0.001	C117	PQCUV1H103KB	0.01
C52	ECEA1CKS470	47	C118	PQCUV1C334ZF	0.33
C53	PQCUV1E153MD	0.015	C119	ECEA1CKS470	47
C54	PQCUV1C683MD	0.068	C120	ECEA1HN100S	10
C55	ECUV1H104MD	0.1	C121	ECEA0JU471	470
C56	PQCUV1H103KB	0.01	C123	PQCUV1H300JC	30P
C57	PQCUV1H223KB	0.022	C124	PQCUV1H300JC	30P
C58	ECEA1HKS010	1	C125	PQCUV1E333MD	0.033
C59	ECEA1VKS4R7	4.7	C126	PQCUV1H332KB	0.0033
C60	PQCUV1C683MD	0.068	C200	ECUV1H104MD	0.1
C61	PQCUV1H103KB	0.01	C210	PQCUV1H103KB	0.01
C62	ECEA1CKS220	22	C212	ECEA1CKS100	10
C63	ECEA1VKS4R7	4.7	C213	ECEA1CKS100	10
C64	PQCUV1H223KB	0.022	C214	ECKD1H103KB	0.01
C65	ECEA1CK101	100	C215	ECUV1H104MD	0.1
C66	PQCUV1C683MD	0.068			

Station Programming

Station programming must be done on each extension which is connected in parallel.
Be sure that the handset is on the cradle, the SP-PHONE button is off and the AC adaptor is connected.

AUTOMATIC LINE SELECTION (WHEN GOING OFF-HOOK)

This feature allows you to automatically select the line when lifting the handset or pushing the SP-PHONE button.

1.  Push **PROGRAM**.
2.  Push "＝".
3.  Push **"1"**, **"2"**, **"3"**, or **"4"**.
   - "1" ··· for Line 1 use
   - "2" ··· for Line 2 use
   - "3" ··· for Intercom use
   - "4" ··· for Line 1/Line 2 use (When Line 1 is busy, Line 2 is automatically selected if Line 2 is free.)
4. Push **MEMORY**.

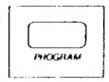
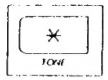
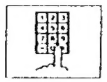
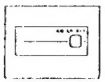
■ To use the extension (which has been programmed for outside line use) for intercom use, push the INTCOM button then the extension button.

■ To use the extension (which has been programmed for intercom use) for outside use, push the LINE (1 or 2) button.

INTERCOM ALERTING TYPE SETTING

The intercom alerting type (Bell/Voice) at a receiving extension can be programmed.

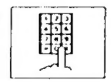
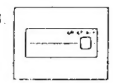
BELL: Bell alerting sound at the receiving extension.
VOICE: Voice alerting is heard through the built-in speaker on the receiving extension.

1.  Push **PROGRAM**.
2.  Push "＊".
3.  Push **"1"** **"2"** **or "3"**.
   - "1" ··· Bell alerting
   - "2" ··· Voice alerting
   - "3" ··· Automatic answer intercom
4.  Push **MEMORY**.

■ **Automatic answer intercom:**
Allows you to answer an intercom call in the automatic hands-free mode without any operation.

EXECTIVE OVERRIDE (Barge-In)

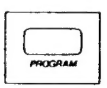
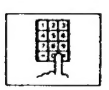
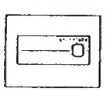
Allows you to intrude into another extension that is in conversation with an outside party.

1. Push **PROGRAM**.
2. Push **MUTE**.
3.  Push **"1"** or **"2"**.
   - "1" ··· Barge-in is disable
   - "2" ··· Barge-in is enable.
4.  Push **MEMORY**.

■ To intrude another party's conversation push the LINE1 (or 2) button after lifting the handset.

EXTENSION NUMBER ASSIGNMENT

To make an intercom call to another KX-T3250, assign an extension number at each KX-T3250.

1.  Push **PROGRAM**.
2.  Push **"1"**, **"2"**, **"3"**, **"4"** or **"5"** on the dial pad
   - "1" ··· To assign number 1.
   - "2" ··· To assign number 2.
   - "3" ··· To assign number 3.
   - "4" ··· To assign number 4.
   - "5" ··· To assign number 5.
1.  Push **MEMORY**.

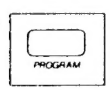
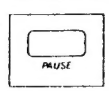
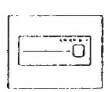
• If you set the same number which has been assigned already, the alarm will sound to indicate this setting is invalid.

■ **Erasing the extension number:**
1. Push the PROGRAM button.
2. Push "0".
3. Push the MEMORY button.
4. Push the PROGRAM button.

■ **To change the extension number after assigning 5 numbers:**
1. Clear the number(s) using the erase procedure above.
2. Enter a new number using the extension number assignment procedure.

TOLL RESTRICTION

The long distance call may be restricted.

1.  Push **PROGRAM**.
2.  Push **PAUSE**.
3. Push **"1"** or **"2"**.
   - "1" ··· No restriction
   - "2" ··· Toll restriction: Local calls and the specified toll calls which you can program are allowed. Other calls are prohibited.
4.  Push **MEMORY**.

■ **The following calls are not prohibited:**
- 911, 800, 411, 0 (for an operator call).
- Calls of area code whose second digit is not "0" or "1".

■ Even when in the toll restriction mode, up to 5 area codes can be allowed for making calls, once they are programmed.
To program these 5 area codes (consisting of 3 digits):
Enter the following after step 2 described on the left.

[2] [＝] [area code (3 digits)] [＊] [＝] [area code (3 digits)] [＊] [＝]
[area code (3 digits)] [＊] [＝] [area code (3 digits)] [＊] [＝]
[area code (3 digits)] [＊] [MEMORY]

• In some areas, number "1" may be required before the area code when dialing. However "1" is not required when programming.

• When the second digit of your exchange code (3 digits) is "0" or "1", program your area code to permit your local calls.

■ To toggle between No restriction and Toll restriction with 5 area codes allowed, enter as follows after step 2.

[1] [MEMORY] ··· No restriction.
[2] [MEMORY] ··· Toll restriction with already stored 5 area codes allowed.

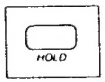
■ To cancel the stored area codes, enter as follows after step 2.

[2] [＝] [MEMORY]

■ When using KX-T3250 behind PBX, use toll restriction feature provided with the PBX.

Hold

TO PLACE A CALL ON HOLD

1. 

Push **HOLD** while in conversation.
- In case of the outside line, the LINE indicator light which is in conversation will start blinking slowly (green).
- In case of the intercom line, the INT'CON Indicator light which is in conversation will start blinking slowly.
- You may replace the handset on the cradle.

TO RELEASE A HOLD

If the handset is off-hook

■ **In case of the outside line;**
1. Push the LINE button whose indicator light (green) is blinking slowly.
2. Start speaking.

■ **In case of the intercom line;**
1. Push the INT'COM button.
2. Start speaking.

If the handset is on the cradle

■ **In case of the outside line;**
1. Lift the handset and then push the Line button (or push the SP-PHONE button and then the Line button) or push the Line button.

■ **In case of the intercom line;**
1. Lift the handset and then push the INT'COM button (or push the SP-PHONE button and then the INT'COM button) or push the EXTENSION key.

TO RELEASE A HOLD FROM ANOTHER EXTENSION

■ **In case of the outside line;**
1. Lift the handset (or push the SP-PHONE button).
2. Push the Line button whose indicator light (red) is blinking slowly.
3. Start speaking.

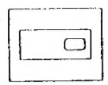
Intercom

You can converse with another person at a parallel extension (KX-T3250)
Extension number should be assigned to each extension.

MAKING AN INTERCOM CALL

When the intercom use is programmed at your extension lifting the handset allows you to select an intercom line automatically.
Note: When the intercom line is busy (INT'COM Indicator light is red color), making another intercom call is invalid.

1.
Lift the handset or push the SP-PHONE button.

2. 
Push **EXTENSION key** (**"1"** through **"5"**).

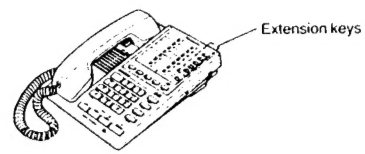
■ When the intercom use is not programmed at your extension.
1. Lift the handset or push the SP-PHONE button.
2. Push the INTCOM button.
3. Push EXTENSION key ("1" through "5")

RECEIVING

1.
Lift the handset (or push the SP-PHONE button) and answer.
- You can talk to the caller over the intercom.

■ In case of "Voice alerting" is programmed at receiving extensions:
An intercom caller hears two confirmation tones after pushing an EXTENSION key, and then starts speaking for a reply.
The called party hears two confirmation tones (or voice) and then lifts the handset to talk with the caller.

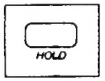
■ In case of "Automatic answer intercom" is programmed at receiving extensions:
An intercom caller hears two confirmation tones after pushing an EXTENSION key, and then start speaking.
The called party hears two confirmation tones and then speaks to the unit without any operation (hands-free).



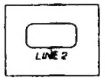
These operation are explained using an example.
In case of the intercom line, you can not have two intercom calls (one is on hold and the other is to be called)

TO PLACE A CALL ON HOLD, AND MAKE OR RECEIVE ANOTHER CALL

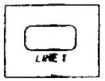
Example:
Call in progress ..... Line 1
New call ..... Line 2

1. 

Push **HOLD**.
- Line 1 is now on hold.

2. 

Push **LINE 2** and make or receive a new call.

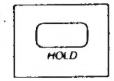
3. 

Push **LINE 1** when the call is finished on Line 2.
- The new call is terminated and the call on hold is returned to the conversation.

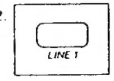
4. To terminate the call, replace the handset on the cradle.

TO TALK TO FIRST CALLER WITH SECOND CALL ON HOLD

Example:
The first call is on hold ..... Line 1
The second call is in progress ..... Line 2

1. 

Push **HOLD**.
- Line 2 is now on hold.
- Line 1 is still on hold.

2. 

Push **LINE 1**.
- Line 1 is returned to the conversation.
- Line 2 is still on hold

TO TERMINATE THE CALL IN PROGRESS AND RETURN TO CALL ON HOLD

Example:
Call on hold ..... Line 1
Call in progress ..... Line 2

1.

Push **LINE 1** and talk.

ANSWERING AN INTERCOM CALL DIRECTED TO ANOTHER EXTENSION (Dial Call Pickup)

You may answer an intercom call that is ringing at another extension.

1.
Lift the handset (or push the SP-PHONE button).

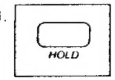
2.

Push **PAGE**.

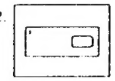
■ When the intercom use has not been programmed at your extension.
1. Lift the handset (or push the SP-PHONE button).
2. Push the INT'COM button.
3. Push the Page button.

TRANSFERRING TO ANOTHER EXTENSION

Calls on outside line or intercom line may be transferred to another extension.

1. 

Push **HOLD** while talking on an outside line or intercom line.
- The Line indicator light will turn to green and start blinking.
- The Int'com indicator light will turn to green.

2. 
Push **EXTENSION key** ("1" through "5").
- You may talk with the other party to whom you want to transfer, before replacing your handset.

3.
Replace the handset on the cradle.
- Replacing the handset causes the call to be transferred.

Note: If the party to whom you have transferred does not receive the transferred call, the call must be returned to you by pushing the following button (to release a hold) and then talk with that party.
- on Line 1 ..... push the LINE 1 button.
- on Line 2 ..... push the LINE 2 button.
- on Intercom line ..... push the INT'COM button.

Conference

You may change a 2-party conversation into a 3-party conference (2-outside/1-inside), (1-outside/2-inside).

TO ESTABLISH CONFERENCE

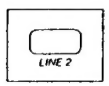
These operation are explained using examples.

An example of (2-outside/1-inside)

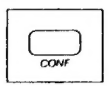
Talking with outside 1 ..... Line 1
New outside party 2 ..... Line 2

1.

Push **HOLD**.
- Line 1 is on hold and a Dial-Tone is heard.

2. 

Push **LINE 2** and then dial the phone number.
- You are now in conversation with Line-2 party.

3. 

Push **CONF**.

4.
Replace the handset when the conference is finished.
- Both outside lines are terminated.

Another example of (1-outside/2-inside)

Talking with outside 1 ..... Line 1
New inside party 2 ..... Extension 2

1. Push the **HOLD** button.
   - Line 1 is on hold and a Dial-Tone is heard.
2. Push the **EXTENSION**-2 key
   - You are now in conversation with extension-2 user.
3. Push the **CONF** button.
4. Replace the handset when finished.
   - Other parties remain connected together and continue talking with each other.

■ In case of (1-outside/2-inside):
When placing an intercom call on hold to prepare for making an outside call, a Dial-Tone will not be heard. However, proceed to push the Line button to select an outside line and then dial the phone number.

TO TERMINATE ONE CALL AND TALK WITH DESIRED PARTY

To Talk with One Outside Party

1. Push the LINE 1 (or 2) button to talk with the party you want to.
   - The other party's line is terminated.
2. Continue talking.

To Talk with Inside Party

1. Push the INT'COM button.
   - The outside line is terminated.
2. Continue talking.

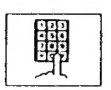
Storing Number during a Conversation (Memo Dial)

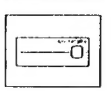
While engaged in conversation, another telephone number can be stored into the MEMO button.
So you can dial the number by pushing the MEMO button. This function is useful to store a telephone number which is given to you by the other party during a conversation.

To Store the Phone No.

1.

Push **PROGRAM** during a conversation.
- The MEMORY indicator will flash.

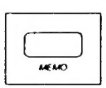
2. 
Enter the phone number (up to **16 digits**).

3. 
Push **MEMORY**.
- The MEMORY indicator will go out

Note:
If you store a new phone number into memory using the "Memo Dial" feature, the previously stored "Memo Dial" number will be erased.

To Dial

1.
Lift the handset (or push **SP-PHONE**).

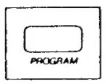
2. 

Push **MEMO**.

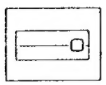
Memory Transfer

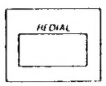
You may store the last dialed phone number (which is already stored in the REDIAL button) into the DIRECT CALL button.

STORING THE LAST DIALED NUMBER (Redial Memory Transfer)

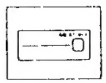
1. 

Push **PROGRAM** until the MEMORY indicator lights.

2. 
Push the DIRECT CALL button.

3. 

Push REDIAL.

4. 
Push **MEMORY**.

5.

Push **PROGRAM**.

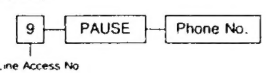
■ Up to 30 digits will be dialed when using the redial function.
When storing the last dialed number into memory, maximum amount of digits can not exceed 16 digits.

An Outside Line or a Computer Accessed Line

The PAUSE button function in a dial operation is helpful when accessing an outside line or a Computer-Accessed long distance service.
If you push the PAUSE button, you can dial the phone number without waiting for the line access or computer tone.

One pause is required when waiting for an outside dial tone.

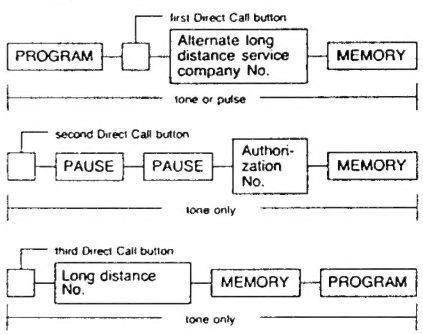
Example (PBX):



Some PBXs require this "PAUSE" during an automatic redial.

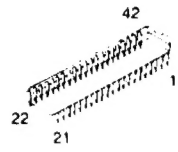
Two pauses are required when waiting for a computer access tone.

Example (FOR MCI, SPRINT, etc.):
To store phone number into three Direct Call button.

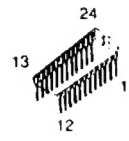


- 2 or 3 memory stations are required, as one memory cannot store over 16 digits.
- Pushing the PAUSE button once counts as 1 digit.
- Changing the Dialing Mode Selector counts as 1digit.

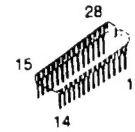
TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES



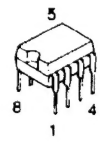
IC1, 2



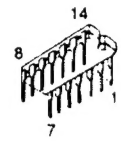
IC3



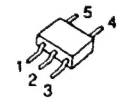
IC4



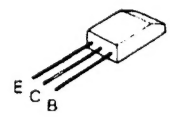
IC5, 8



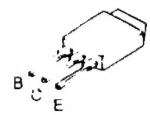
IC6, 7



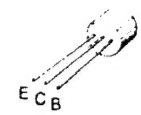
IC9



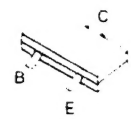
Q1, 3, 8



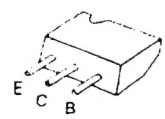
Q2, 4



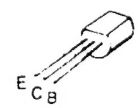
Q5, 6



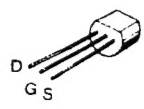
Q7, 10~21, 23~37
40~47



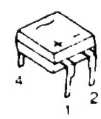
Q9



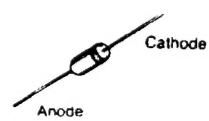
Q22



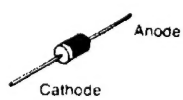
Q38, 39



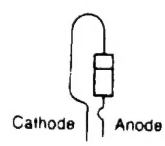
D1, 2, 5



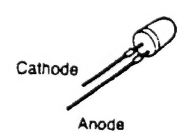
D3, 4, 6~9, 12, 14~18,
20~41, 44~60, 64~71,
74, 76



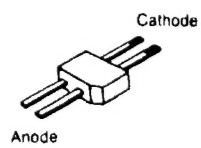
D10, 11, 19, 61~63,
72, 73



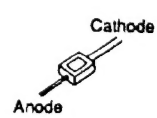
D13



D42, 43



D201~203



D204~208